Victory Loan—They finished their job—Let's finish ours!

Contractors and Engineers Monthly

Vol. 42, No. 10 OCTOBER, 1945 $3 a Year, 25 Cents a Copy

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Covering the Field

Coming Construction
A survey of contemplated construction in both the private and public-works fields starts on page 1. The status of the Federal-Aid highway program is reported on page 12.

Levee Drainage Structure
A triple 72-inch gravity drainage structure featured a contract for the repair of a flood-damaged levee in Illinois. See page 1.

Big Concrete-Paving Job
Started during wartime because of the strategic importance of the route, work on a 22-mile highway project, involving grading, new location, bridges, and concrete paving by eight contractors, is described on page 1.

Seabees' Bituminous Plant
The use of gravity to speed up operations was a feature of a bituminous plant for road and airfield paving in the Pacific. See page 2.

County Road Problems
Four types of bituminous surfacing on plant-mixed base for county roads, as well as organization, financing, and other phases of county road work, are described in two feature articles on page 6. The post-war plans and problems of a midwest rural county are reported on page 55.

Largest Rolled-Earth Dam
Methods of placing the three types of earth in Anderson Ranch Dam, to be the world's highest earth-fill dam, and the compaction tests to insure proper placing and rolling are covered in an article on page 15.

State Employment Policies
Maintenance divisions of state highway departments are facing the serious problem of securing sufficient competent employees to carry on this essential service. Salaries vs wages, pensions, and other policies affecting employee welfare are an important factor in this problem. See page 49.

Bridge Floated to Site
An unusual steel bridge job was completed this month. An article on page 57 and photos on pages 64 and 65 describe and illustrate how old spans were moved 90 miles to become part of the new structure.

Sand-Asphalt Paving
Two methods of laying sand-asphalt mix, one using a traveling plant set up in the sand pit and the other road-mixing in place by a similar plant, resulted in 7 miles of resurfacing in the south. See page 73.

Harbor Excavation
A report on the use of clamshells by the Seabees for speedy harbor improvement in the Palau Islands in the Pacific contains an interesting analysis of production figures and job accomplishments. See page 81.

U. S. E. D. Photo
Pipe for a new drainage structure in a levee near Fort Chartres, Ill., was handled by a Koehring dragline.

Triple Drainage Pipe Through New Levee

By WILLIAM H. QUIRK,
Eastern Field Editor

Two Gravity Structures and New Section of Levee at Fort Chartres, Ill., Replace Old Culvert Lost in Flood

✦ A TRIPLE 72-inch gravity drainage structure to replace an old concrete floodwall with sluice gate that was washed out in the 1944 flood, when the levee was also topped and breached, has been constructed near Fort Chartres, Ill., in the levee on the east bank of the Mississippi River. The contract for the construction of this large drainage structure, consisting of three galvanized corrugated-iron pipes, each 250½ feet long, with sluice gates and concrete head wall, plus the construction of an 18-inch culvert and head wall and automatic gate, and repairs to the damaged levee involving the placing of approximately 50,000 cubic yards of fill, was awarded to Joseph L. Pohl, a contractor from Nevada, Mo., by the U. S. Engineer Department on his low bid of $67,000. Work was started in September, 1944, and completed in March, 1945, under the supervision of the St. Louis Engineer District.

The two new drainage structures, which are 3,000 feet apart, lie in the Fort Chartres and Ivy Landing Drainage District in Randolph County, Ill. Only the levee immediately surrounding the structures was repaired in this project; the adjoining levee, which was also broken through, was rebuilt under a separate contract. The larger drainage structure was laid in a trench dug 15 to 16 feet below the natural ground. The levee section over the pipe was built to a height of 14 feet above natural ground, or to a net grade of 401.5 above mean sea level, and has a flat 8-foot-wide crown from which the river-side slope descends 1 on 3 and the land-side slope about 1 on 4, containing a 1 on 5½ seepage line originating on the river-side slope 2 feet vertically below net grade. This 500-foot section, which conforms to standard U. S. Engineer specifications for permanent levees, was built in a new location from the ground up, and ties in to the existing rebuilt levees.

Over the smaller 18-inch gravity drainage structure, 300 linear feet of levee was rebuilt, with a smaller cross section, to a height of about 6 feet above natural ground, or to a cross grade of 392. This levee also has an 8-foot crown and 1 on 3 side slopes, with a base width of from 40 to 50 feet. At some future time this smaller levee will be rebuilt to the standard section now in place over the triple drainage structure.

In this levee district, a strip of bottom land about 4 miles wide lies between the Mississippi River and the high bluffs to the east. A large part of the surface run-off from the hills behind the levee area empties into a large naturally formed interior lake known as Kidd Lake. It in turn empties into a ditch called One Mile Race Creek, which flows into the Mississippi through the large drainage structure. The construction of this structure eliminates the need for flank levees along One Mile Race Creek, which would otherwise be required to protect the area

(*Continued on page* 42)

Anticipated Volumes Of Post-War Projects

Bureau of Labor Statistics Issues Summary of Studies of Plans for Public and Private Construction

✦ ANY forecast of post-war construction is necessarily conjectural and changes from month to month and even week to week as more groups of public and private officials complete their plans to the contract stage, ready for bids when construction materials and labor are available. The United States Bureau of Labor Statistics has made a detailed study of construction volume in the past and of the various demands for such work as a result of the almost complete blackout of civilian construction during the war years. This review of the report for readers of CONTRAC-

(*Continued on page* 31)

A 22-Mile Highway Job; Grading, Bridge, Paving

Over 1,000,000 Yards of Dirt Moved; Bridge Widened; Large Drainage Structures; Concrete Paving

✦ EIGHT contractors are building a new 22-mile road in the west-central part of Alabama on U. S. 11, relocating it mostly through a region that hitherto could be reached only on foot. Beginning 1½ miles outside the city of Tuscaloosa at the grounds of the University of Alabama, a 1¾-mile stretch of the existing road to the east is being improved, following which a 1¾-mile section, built three years ago, is skipped, whereupon the line of the new road leaves the old and cuts across country to tie in to State Route 5 at Woodstock. The present U. S. 11 follows a parallel but longer course north of the new location and meets Route 5 at Bucksville, 8 miles above Woodstock.

Work on the approximately 1,000,000 yards of grading and culverts began in March, 1945, and by July had progressed sufficiently so that pouring of the 24-foot concrete slab was started, but the project is not expected to be completed until the middle of 1946. An important phase of the work is the widening of a reinforced-concrete structure, crossing the Gulf, Mobile & Ohio railroad, from a 22 to a 44-foot roadway width.

The new construction is being financed three-quarters by the Federal government and one-quarter by the State of Alabama, with Tuscaloosa County furnishing the right-of-way. Permission for the work was granted by the War Production Board because of the bad condition of the existing road caused by wartime traffic over this im-

(*Continued on page* 21)

NOT AN ATOMIC BOMB

A charge of 1,000 pounds of 60 per cent gelatin dynamite blasts a submerged coral head on a Seabee harbor-clearance assignment in the Palau Islands in the Pacific. See page 81.

Seabees Use Gravity To Speed Operation Of Bituminous Plant

By R. P. DAY, CCM, USNR

Rock-Crushing and Asphalt Plant Set-Up in Pacific Is Adapted to Exigencies of Naval-Base Problems

✦ SEABEES of a U. S. Naval Construction Brigade have utilized the forces of gravity to simplify and add to the efficiency of a bituminous plant which they are operating at a Pacific Naval Base. By setting a Barber-Greene bituminous plant, with attendant rock-crushing machinery, against the side of a 30-foot natural incline, they did away with hot and cold elevators, ordinarily the cause of frequent plant delay.

Furthermore, by setting the asphalt tanks against the same hillside, gravity is used so efficiently that only one asphalt pump was needed. The efficiency of the steam system was increased by insulating the steel asphalt tanks and both the steam and asphalt pipes, in the field, using methods which will be treated in greater detail later. The boilers which were furnished with this plant are able to handle the steam load at design capacity, following the installation by the Seabees of a 500-cfm air compressor to take care of the drier burners and an asphalt-drum heating torch.

The Seabees and Army Engineers have for quite some time been using black-top in the Pacific for airfields, highways, and access roads. Crushed mineral filler has usually been found readily available at the sites, but in all cases the asphalt has been hauled thousands of miles.

So one of the biggest problems the asphalt men in the Pacific have faced dealt with that fact, with all the other local issues thrown in. Bitumen is precious material, coming all those miles from the United States. All mix designs must necessarily be light on fines, in order to avoid the 200-mesh particles' soaking up asphalt like a sponge. The work was so urgent, speaking broadly, that mineral filler had to be made without mistakes. Plants ran 24 hours a day, and idle time adjusting a plant-mix could not be tolerated in view of the "rush" nature of placing at the other end.

The plant, set up and operated by Seabees under Commodore W. O. Hiltabidle, Jr., USN, is designed to turn out 120 tons of bituminous mix per hour. It combines a 150-ton-per-hour rock-crushing plant with a Barber-Greene asphalt plant, and balances economy of asphalt very nicely with a steady production of mix.

Only One Mix Used

Only one mix has been batched, whether it be for roads, airport runways, or other surfacing. Almost all the traffic on the island is military in nature, and wear under all conditions is decidedly consistent. Moreover, plenty of fine coral has been found available for subgrades.

This kind of material has proved very stable. It never varies much, whether it is put down wet, medium, or dry. One mix, therefore, has been found to be adequate for all needs, and was far less confusing to the many men new to the asphalt business who worked around the plant. Speed of production at this base had a much higher priority than hair-splitting accuracy.

The mix follows:

Size of Screen	Per Cent Retained	Per Cent Passing
1-inch	0	100
¾-inch	15	85
No. 4	50	50
No. 10	65	35
No. 40	80	20
No. 60	82½	17½
No. 200	93	7

Bitumen, 6 per cent by volume

The mineral filler is largely a coralif-erous limestone, composed of both animal and nullipore coral. Streaks of calcite which show evidence of great heat and pressure in some bygone geological age are also present. The absorption factor of calcite is low; of softer coral rock it is somewhat higher. These factors fluctuate sufficiently from day to day to vary the per cent of bitumen from 5.04 to 6.7 per cent by volume.

Plant Set-Up

The gravity scheme is carried out on this plant all the way from the initial receiving hopper to the truck bodies which receive the finished mix. Rock, passing from the quarry through the plant, goes over this route:

(a) Quarry-run stones, in pieces generally under 16 inches in size, are dumped into a gravity-type receiving hopper set at the top of the hill. This hopper was made of lumber, steel plate, and a few logs. The retaining walls facing the plant were built of 9-inch-diameter coconut logs and 12 x 12-inch upright Douglas fir timbers. Stones pass through slotted rail openings, measuring 17 x 35 inches. The side of the hopper away from the trucks contains a 27-inch square opening, through which an occasional oversize stone is fed. This is done only when the hopper throat is reasonably clear. The material is picked over fairly well by the shovel which loads hauling trucks at the quarry, so that oversize stones, clay pockets, and debris are kept away from the crushing plant.

(b) An air-operated vibrating feeder sends the rock on down through a 42 x 42-inch opening, past a counterweighted door, to a 24 x 40-inch Cedarapids primary jaw crusher, driven by a Murphy ME-6 diesel engine through a 12-belt V-belt drive. Ordinarily the jaws of this crusher are set at 4-inch clearance, and all material leaves it at minus 4 inches, dropping on a 24-inch conveyor belt which takes it up to the first screening.

Official U. S. Navy Photo

A Seabee Brigade at a Pacific Naval Base set up and operates this aggregate and Barber-Greene asphalt plant to furnish paving material for roads and airfields on the island. Gravity simplifies plant operation.

(c) The material drops off the end of this conveyor to a single-deck Simplicity vibrating screen, with 1-inch square openings. In order to reduce the load on this screen, one panel of openings is set at 1½ inches at the upper end, where the material falls off the conveyor. Passing material drops through to the next conveyor belt. Retained rock travels down into a 24 x 40-inch Cedarapids double roll crusher, and comes out on the same 24-inch conveyor which took passing rock away from the vibrating screen. This conveyor takes the material on to the next step.

(d) The second screen is another Simplicity vibrating type, but it is double-decked to distribute the load. The top deck is composed of 1-inch square openings, with one panel of 2-inch openings. The bottom deck is all set at 1 inch. Material which passes through both decks of this screen drops to a 24-inch conveyor belt. Material passing over both decks goes down through a Universal 18 x 30-inch double roll crusher, and on to the same conveyor belt. This takes the crushed rock, which now is finished, to a surge pile. To take care of crushed rock in excess of that required by the asphalt plant, a stockpile is set up close to the surge pile. It is fed from the surge pile by bulldozers, and the excess crushed rock is loaded out to other activities, including a concrete plant, by a Northwest Model 25 shovel.

(e) Cut-off gates in the roof of a tunnel directly under the surge pile permit the crushed rock to flow to an 18-inch conveyor belt, which takes it up to the drier hopper of the Barber-Greene asphalt plant. This step eliminates one set of asphalt-plant bucket elevators.

(f) The rock goes from the drier hopper to two Barber-Greene Model 833 aggregate driers, set on a 5-degree slope, and turning at 7 rpm. Here the rock is preheated to 290 degrees F. which removes all moisture and prepares the surface for the asphalt. The rock then passes by gravity from the drying ovens, where it was heated, to a pugmill where SC-5 asphalt at 300 degrees is mixed in at the rate of about 6 per cent by volume. The use of a covered chute eliminates the hot elevator in this step, thus reducing maintenance and the possibility of delay by breakdown.

Official U. S. Navy Photo

Seabees at a Pacific Naval Base rigged up this air-driven hoist and skid for moving asphalt drums up a steep hillside to the receiving platform.

Feeding Asphalt to Plant

The asphalt requires from 24 to 36 hours to prepare before it is ready for the mix. The Seabees have rigged up an ingenious air-driven hoist for skidding the drums up the steep hillside to the receiving platform. The skid is about 45 feet long, set on a 30-degree slope. It is made from two 4 x 12-inch timbers, set with the narrow dimension up, and braced with metal tie rods. The sides of the timbers were shaved off just enough to accommodate a barrel of asphalt comfortably.

The rig was made from a Gardner-Denver air hoist, set on a platform at waist height for an operator. The hoist cable was led through a sheave on a swinging frame made from 4-inch steel pipe. Return lines to pull the hoist line back to the barrel pile were hooked to coconut palms 100 feet away from the working platform.

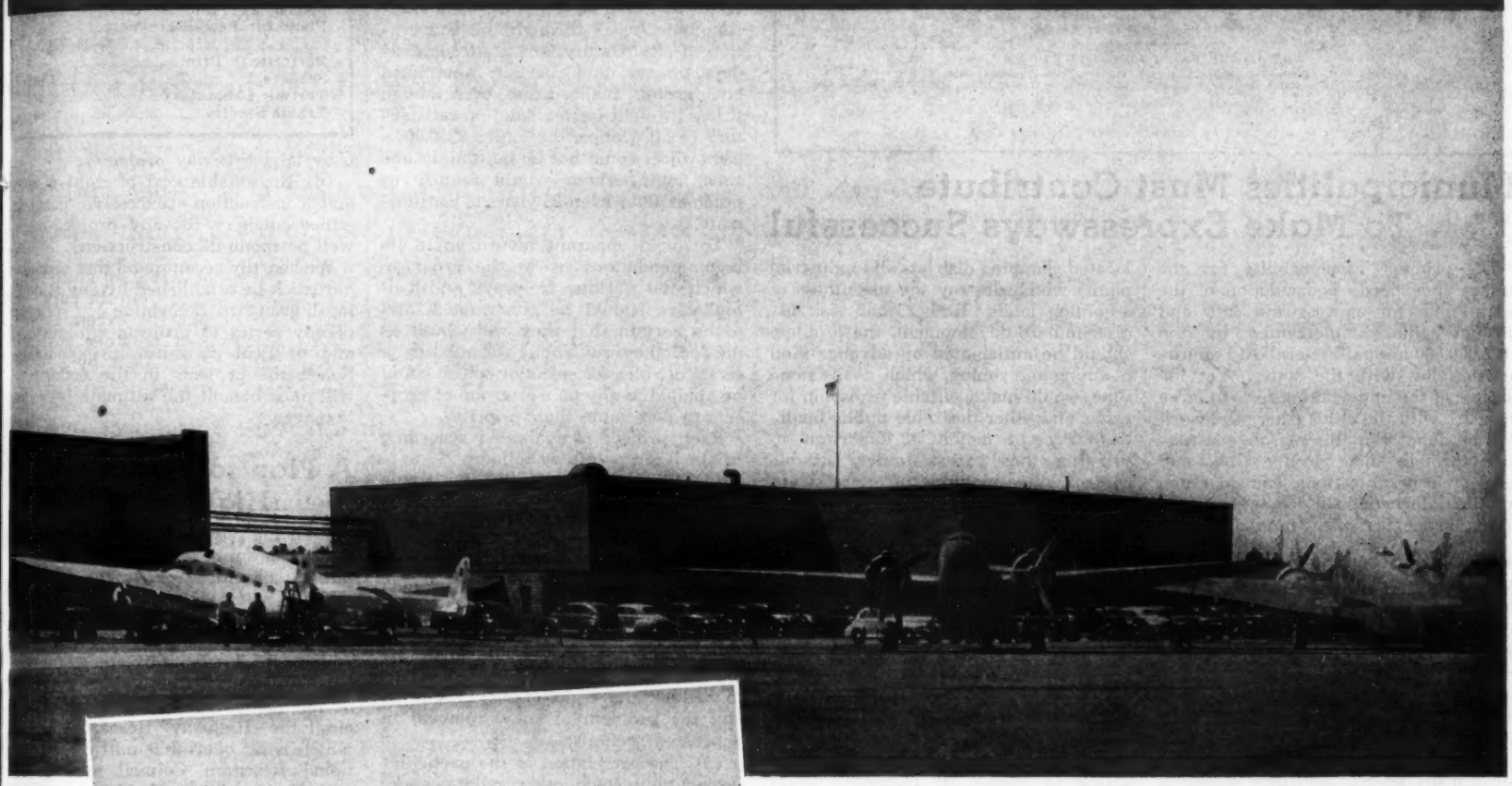
Regular-lay 6-strand preformed plow-steel wire rope is used because, in dumping a barrel of asphalt, men have to handle the ⅜-inch cable. The outer wires of preformed wire rope stay in place, even when the rope is badly worn, and do not wicker up to jab workmen's hands. On a 10-degree fleet angle between the air-hoist drum and the top drum, preformed rope spooled evenly without climbing.

The asphalt barrels are opened by an air-driven Ingersoll-Rand chisel. Grappling hooks attached to the hoist line on the air hoist pull each barrel up the in-

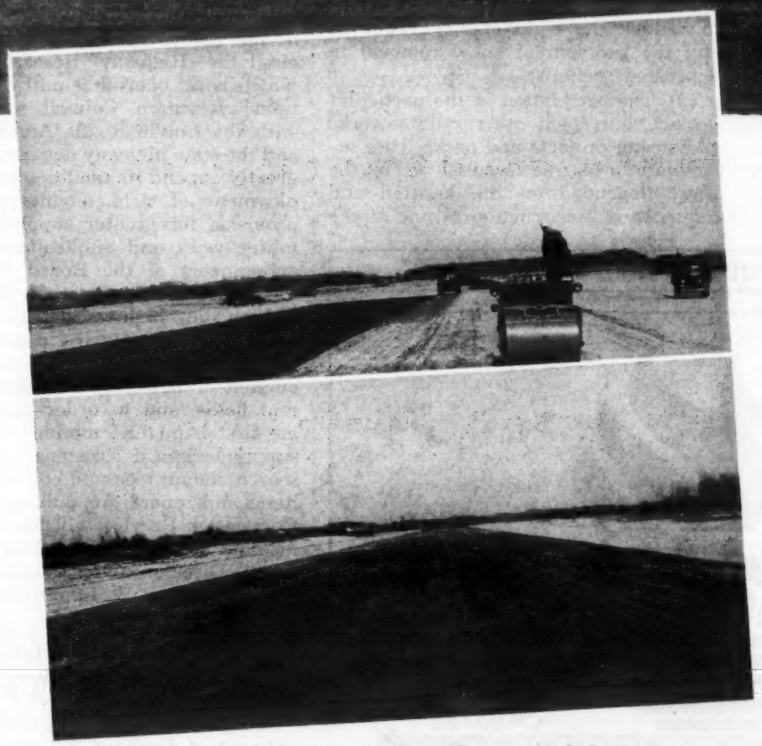
(*Continued on page* 98)

AN AIRPORT FOR AN AIRCRAFT BUILDER

Runways are paved with resilient, heavy-duty Texaco Asphalt



Airplanes and airplane parts, produced by Fleetwings, contributed vitally to the success of America's war effort.



One of Fleetwings airport's three Texaco Asphalt runways, under construction and completed. Contractors were Asphalt Industries, Inc., Morton, Pa., and the Buckite Corporation, Swedeland, Pa.

The Fleetwings Division of Kaiser Cargo, Inc., is an important manufacturer of aircraft and parts. For use in testing the products of its Bristol, Pa., plant, Fleetwings recently constructed a three-runway flying field. Each runway is 75 feet wide and 3800 feet long, with run-arounds at both ends.

In constructing resilient, heavy-duty Texaco Asphalt paving on all three runways, Fleetwings had ample precedent to justify its action. Millions of square yards of Texaco-paved runways are serving scores of Army, Navy and civilian airports from the Atlantic Seaboard to the Rockies.

Engineers will be interested in the fact that both the foundation and wearing surface of the Fleetwings runways are of Asphalt construction. The foundation is six inches of Texaco Asphalt Macadam, built by the penetration method; the surface is two inches of hot, plant-mixed Texaco Asphaltic Concrete.

There is a type of Texaco Asphalt construction for runways, taxiways, hardstands and parking areas, to match the needs of every flying field. Texaco Engineers, who are Asphalt specialists, will be glad to discuss your airport paving problem with you and offer their recommendations.

THE TEXAS COMPANY, *Asphalt Sales Dept.*, 135 East 42nd St., New York City (17)

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TEXACO

REG. T. M.

TEXACO ASPHALT

Contractors and Engineers Monthly

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Municipalities Must Contribute To Make Expressways Successful

The primary responsibility for the design and speedy construction of the many miles of expressways into and through cities implemented by the $125,000,000 annual Federal-Aid appropriation lies with the states. Yet the success of the undertaking rests in large measure with the cities where the work will be done. For this reason, contractors, through their service clubs and local civic organizations, can do much to stimulate beneficial cooperation and action on the part of the municipal governments.

First, there must be bilateral action in the selection of the route through the city to serve best the interests of all types of traffic, with the minimum long-term damage to local property. State location engineers and the local municipal engineering department, and politicians, must examine each location with fairness and freedom from petty private interests. The job is being done to serve many people for many years, so necessary temporary disturbances to the lives of some local people or institutions should not be permitted to check great social and material benefits to the community and state as a whole.

Second, but a part of the first, is the cooperation of local persons in the acquisition of right-of-way. It is never the purpose of the engineers responsible for any large or small construction project to cause punitive damages to anyone. State laws protect, many times too well, the citizen dislodged from, or deprived of, a portion of his estate by a new highway facility. Diplomatic dealings handled in a friendly manner leave a much more contented owner and save much time and money for the taxpayers.

Next comes the responsibility for protective action by the city itself. The construction of expressways within municipalities brings into being a whole new set of values for land for both residential and industrial use. If non-zoned areas bordering the new highways are not brought under sound zoning control before the highways are constructed, it is all too likely that undesirable residential, commercial, or industrial developments may spring up quickly and impair the usefulness of large adjoining regions before proper safeguards can be set up. It also may be desirable in some instances to remove zoning regulations already established within city limits as a means of making better use of lands in the vicinity of the new highways, inasmuch as the existence of a fast through highway permits replanning and redevelopment of nearby neighborhoods.

Every effort must be made to avoid the creation of ribbon housing developments, the erection of shacks and unattractive dwellings, and improperly located shopping districts and industrial plants which destroy the usefulness of adjoining lands. Rather than risk indiscriminate development, the problem should be anticipated by advance land planning and zoning, which, at the same time, would make suitable provision for parks and other desirable public facilities. Prompt action is important in bringing these areas under suitable control, since planning of expressways is already under way by state highway departments, and it is anticipated that highway construction will be resumed on a broad scale in the near future.

Since it is the *completion* of plans that is so necessary to insure the construction of expressways promptly, civic-minded citizens among our readers may do much to smooth the way for early construction of needed projects in the proper location by offering their services to local administrations in planning, securing right-of-way, and aiding in zoning or re-zoning areas affected by new construction.

But don't high-pressure; remember it is low pressure that carries the heaviest loads.

Selecting Projects In the Proper Order

With the increase in the number of projects ready for construction when the green light shines again, there is going to be uncertainty in some quarters, and on large multi-contract projects, as to the proper order in which the various sections should be started. In the case of urban-traffic facilitation projects, that one which will most alleviate the jams should be built first, and not the one which will dump more vehicles into an already overcrowded street.

The Regional Association of Cleveland, which developed "An Express Highway Plan for the Cleveland Metropolitan Area" through the cooperation of city, county, and state highway departments and certain interested civic groups, realized that, even though it had brought forth a solution satisfactory to all groups, the entire $250,000,000 project could not be built all at one time, and perhaps would require as much as 10 or even 25 years to consummate.

To avoid apparent favoritism in its recommendations as to the order in which the various freeways and belt highways should be constructed, and to be certain that they were built as needed, they set about formulating a series of rules for selection which could be applied to any pair or group of projects to determine their priority.

Each project is evaluated according to six basic points as follows:

(1) Its integration with the whole planned network;

(2) The adequacy of facilities for collecting and distributing traffic carried by that project;

(3) Its adherence to design standards;

(4) Consideration of facilities for traffic operation and maintenance, including tunnels, use of retaining walls to reduce the right-of-way required, and the problem of snow removal in depressed sections;

(5) The correlation of the particular project with such other public works as housing projects and parks, (the selection of a Marine Hospital site by the Navy depended on the location and sequence of construction of one of the Cleveland Freeway projects);

(6) Reasonable cost of right-of-way and construction (excessive costs in either category for any project might well postpone its construction).

We heartily recommend that a similar yardstick be established by any state or local group to determine the priority of any series of projects without bias and political pressure or expediency. Select the projects in the order that will most benefit the ultimate user, the taxpayer.

VICTORY—NOW YOU CAN INVEST IN IT!

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A Plan to Expand Highway Research

With the post-war $1,000,000,000 annual program of highway improvement already provided for by the Congress and the states, the need for an intensified program of highway research is recognized. In order to meet more adequately the imperative need for correlation and coordination of the work of the many highway research agencies, the Highway Research Board, which is an operating unit of the National Research Council, cooperating with the Public Roads Administration and the state highway departments, will greatly expand its facilities by the employment of field engineers and by provision for greater support of committee work and publications.

Engineers of the Board will spend a considerable part of their time visiting the state highway departments and other research agencies in order to acquire comprehensive knowledge of current or past research in their several fields, and in order to disseminate first-hand information. They will supply technical assistance to the research committees and collect research items and reports for publication. This Correlation Service will be in the immediate charge of Fred Burggraf, Associate Director, under the general supervision of Roy W. Crum, Director.

Public Works Plans To Be Aided by FWA

Along with the announcement of curtailment of Lanham Act projects, due to the end of the war, Major General Philip B. Fleming, Federal Works Administrator, has announced that the Bureau of Community Facilities of the Federal Works Agency is expanding its advance planning program to assist states and local governments in the preparation of plans for needed public works.

Projects under the Lanham Act which were authorized as war activities to meet war needs, if not actually under construction, are to be suspended immediately pending action to rescind the allotments. Such projects under construction may continue either to completion or completion of a useful unit if it can be shown that the need for the facility still exists.

NOW! POSITIVE CONTROL

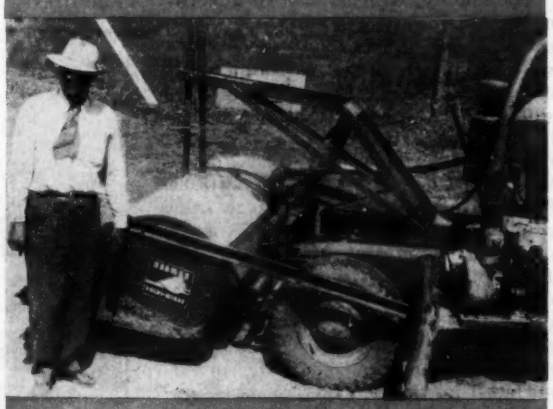
IN ADMIXTURE OF THE WATER INCREMENT

SEAMAN DEVELOPMENT ADDS WATER DIRECTLY AT CRITICAL MIXING POINT—

Prevents Migration and Evaporation Loss ... Assures Uniformity of Mix and Promotes Maximum Density.

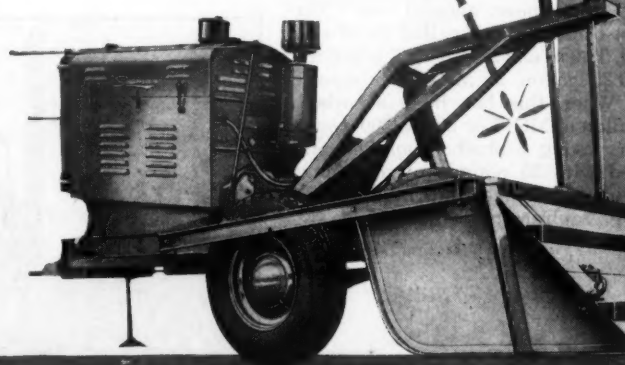
The addition and mixture of the water increment is the most important step in any soil stabilization process,—and in earth work where compaction of maximum density is a requirement. But losses through evaporation and migration, together with unequal absorption of moisture by the soils, constituted variables which were extremely difficult to control. Perhaps the most important development in securing uniformity of mix,—reducing migration and evaporation loss, was the introduction of the SEAMAN MIXER to road mix operations. But,—because practice still dictated that the water distributor operate, necessarily, at some distance ahead of the SEAMAN,—migration and evaporation, although greatly reduced,—still were important variables. TODAY—a SEAMAN development adds the water directly at the point where the rotor of the SEAMAN MIXER makes its mixing contact with the soil.—Hardly a fraction of a second elapses before the mixing tines have brought water and pulverized soil together in a thorough, uniform, and intimate mix. In bitumen processing, this SEAMAN development is hailed as a means of saving in volume of oil required to bring the mix to specification and to obtain far greater coverage. Obviously, it eliminates "rich" and "lean" spots and reduces the number of passes needed to secure uniformity. In the employment of this new practice,—the water or oil distributor travels at the side of the SEAMAN. If the distributor is equipped with a pump,—a hose is connected directly to a spray bar exactly as wide as the mixing rotor, attached to the frame at the SEAMAN MIXER just ahead of the revolving tines;—otherwise a pumping unit is mounted on the floor boards of the SEAMAN and the fluid pumped from distributor to spray bar. Just as simple as that! Yet since its introduction to road mix and earthwork construction, it is fast becoming a part of state and county highway mixing specifications!

Spray-bar is attached to SEAMAN MIXER frame just ahead of hood;—sprays oil or water directly at point mixing tines contact materials.



Pump unit may be mounted on the running board of the SEAMAN MIXER if the water or oil distributor is not so equipped.

Water or oil distributor travels at side of SEAMAN MIXER, with hose to pump or spray bar. Notice the fine pulverization and uniform color of the mix.



For complete description of "Mixing-Point Admixture" and detailed "spec's" of the equipment and its mounting,—write to SEAMAN MOTORS.

ASK FOR TECHNICAL LETTER. E33.

C112

THE SEAMAN MIXER

Write to **SEAMAN MOTORS** *Milwaukee 3, Wisconsin*

County Highway Problems Solved by Common Sense

Plant-Mixed Base Surfaced With Four Bituminous Types; Asphalt Plant Supplies Mix For District Maintenance

Organization, Finances, Bridge Problems, Servicing County Equipment, Pressure Put on Post-War Planning

By FRANK B. SARLES,
Western Field Editor

✦ PROBLEMS in the construction and maintenance of roads and bridges which are perhaps as varied as those of any county in the country confront the Road Department of Monterey County in west-central California. Within its boundaries are both a broad fertile valley where agricultural development is intensive and property values extremely high, and large areas of sparsely settled and undeveloped rugged mountains with little rainfall and less vegetation. Over 100 miles of Pacific Ocean coastline form this county's western boundary; and one of California's most troublesome rivers, having flow variations of from 10 cubic feet to 50,000 cubic feet per second through the highly developed central valley, adds much to the difficulties of the County Road Department.

The county, with its seat of government at Salinas in the northern part, is roughly 115 miles in length northwest-southeast with widths of from 7 to 40 miles. Its area is approximately 3,400 square miles, a large portion of which is extremely rugged. Rainfall varies from 12 to 17 inches annually. Although the mountains range as high as 5,000 feet above sea level, there is no snow problem due to the proximity of the ocean. The county road system totals 1,090 miles with 16 miles of portland-cement concrete; 3 miles of asphaltic concrete; 481 miles of bituminous macadam, oil-mix, and oil-seal; 352 miles of gravel roads; and 238 miles of unsurfaced but graded dirt roads.

Although the Road Commissioner of Monterey County feels that construction by contractors selected through competitive bidding is distinctly advantageous, and has awarded work by that procedure in the past and intends to award more of it in the future, the shortage of contractors willing to undertake small county projects when more profitable wartime contracts could be obtained has necessitated the performance of much essential construction by county forces. Part of the work has been contracted even during wartime, however, such as the production of aggregates and the application of asphalt.

Road-Base Construction

For new road construction, Monterey County usually specifies the application of a 4-inch blanket of pit-run sand over all adobe subgrades. On this blanket is placed from 4 to 7 inches of granular base, though different materials are used in the southern end of the county than in the north where commercial plants are available to produce crushed-stone base. In the latter area, material is used which meets the following specifications:

Sieve Size	Per Cent Passing 2-inch Maximum	Per Cent Passing 1½-Inch Maximum
2½-inch	100	.....
2-inch	90-100	100
1½-inch	.....	90-100
¾-inch	50-80	50-90
No. 4	30-50	30-50
No. 200	3-11	3-11

The material may not have a loss of more than 50 per cent after 500 revolutions under the Los Angeles rattler abrasion test.

Material complying with these specifications and mixed in a rotary-drum or pugmill mixer fed by weight from two bins containing coarse and fine aggregates is usually purchased from commercial producers. Water is added during the mixing process at the rate of 125 pounds or less per ton of mineral aggregate.

The mixed material is placed on the prepared subgrade through spreader boxes adjusted to deposit enough loose material to provide the specified compacted thickness, never more than a 4-inch compacted thickness being laid in a single course. It is brought to uniform profile and cross section by a blade grader with a wheelbase at least 15 feet long.

Rolling follows immediately by either pneumatic or steel-wheel rollers. For the latter, a minimum weight of 10 tons is specified with a load of not less than 325 pounds per linear inch of width on the rear wheels. For pneumatic rollers, a minimum weight of 7 tons is required with a weight per tire of at least 1,500 pounds. Adjacent tires must be not more than 5 inches from sidewall to sidewall and tires on the back axle are staggered in relation to the tracks of the front tires. Inflation must be equal in all tires. A sufficient number of rollers is required to assure the use of one roller for each 400 tons of base laid per 8-hour day.

In the southern part of the county, pit-run gravel base is used instead of crushed rock because of its ready availability and lower cost. This gravel is run over a 2½-inch scalping screen and ordinarily contains approximately 10 per cent of material passing the No. 200 sieve.

Methods of laying are the same as those specified for crushed-stone base in the north, except that the material is frequently hauled dry to the road, where water is added and mixing done by a blade grader.

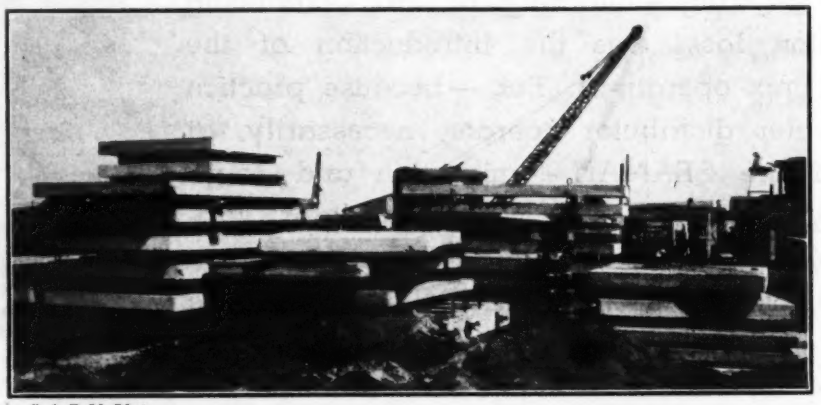
"Oil Seal" for Light Traffic

On this base one of three types of surfacing is usually laid, dependent on anticipated traffic, with a fourth type coming into more general use. For lightest traffic, what is called an oil seal is used. The base, after drying, is primed with 0.25 gallon of MC-1 per square yard. When this has been absorbed, 0.35 gallon of MC-5 or 200 to 300-penetration paving asphalt is applied and covered with 30 pounds of screenings per square yard, meeting the following grading requirements:

Sieve Size	Per Cent Passing
¾-inch	100
½-inch	90-100
⅜-inch	50-80
No. 4	0-15
No. 8	0-3

Surfacing under this same specification is sometimes used to re-seal an existing bituminous surface which is becoming porous or is raveling. Either as a new surface or for re-sealing, the distribution of asphalt and chips is done at present by county forces, using one of

(Continued on page 38)



C. & E. M. Photo
Concrete slabs for bridges are precast and stored in the Monterey County yard.

✦ LONGEVITY in office is a characteristic of the Road Department of Monterey County, Calif., as Howard F. Cozzens, Road Commissioner and County Surveyor, has served in that position for 30 years, L. Camany has been its Bridge Superintendent for 20 years, and William F. Curtis has occupied the post of Shop Superintendent for 25 years. This continuity of experience and teamwork has aided in the development of a county highway program to solve the varied road problems economically and efficiently.

Although the office of County Surveyor is elective, that office does not, per se, include supervision of the road work, since, under the law, the County Supervisors can appoint anyone they choose to perform that function. However, Monterey County Supervisors have appointed Mr. Cozzens, the present County Surveyor, to the office of Road Commissioner and left the operation, construction, and maintenance of all county works to his direction since 1915.

Organization

Monterey County is governed by a Board of Supervisors, consisting of five members who are elected for 4-year terms, two at one biennial period and three at the following. The County Surveyor is also elected each fourth year.

The Road Commissioner has four engineering assistants, three of whom are at present engaged in post-war planning in the office, while the fourth is conducting field surveys for the same purpose. The county is divided into five districts, each of which contains about equal road mileage although the areas vary considerably. Maintenance work and some construction are handled by a superintendent, with the required crew, in each district while the Bridge Superintendent, with his crew, maintains and constructs bridges and culverts throughout the county; and the Shop Superintendent supervises the mechanical work of keeping the equipment in operating condition.

Finances

The County has a normal annual income for highway use of approximately $325,000, derived from 1 cent of the gasoline tax collected by the State and returned to the counties on a basis of their automobile registration, and from license fees and fines for traffic violations. Sometimes, when expenses are heavy, $15,000 or $20,000 is used from the County General Fund for road purposes but there is no property tax assessed solely for the benefit of the Road Department.

Normal income is, of course, considerably decreased at the present time, and an inspection of the 1943-44 general statement shows the receipts for Road Department use total only $300,523, from which expenditures for improvements were $91,736; for maintenance, $171,003; and for miscellaneous public work in the county, $38,647. Although the total of these expenditures exceeded income by $863, a sizable balance from previous years is available for emergencies.

County Bridge Department

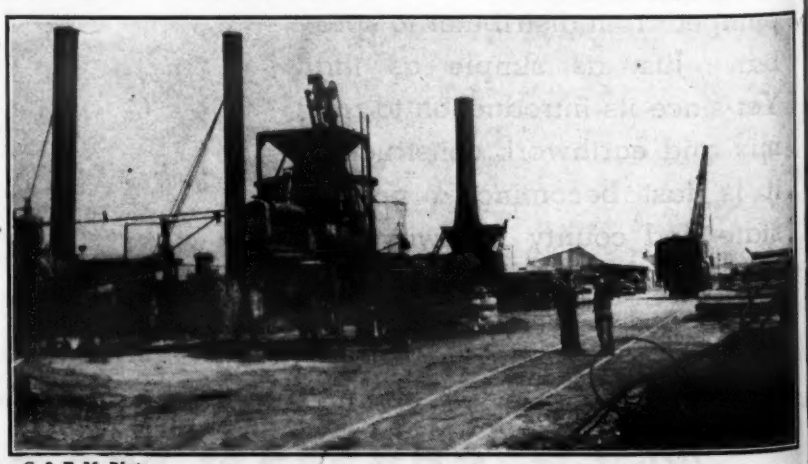
The Monterey County Bridge Department has done, and continues to do, some unusual things. The rugged nature of much of the county causes flash floods taxing the adequacy of drainage structures; drainage ditches in the highly developed agricultural region of the Salinas River valley require the construction and repair of numerous bridges in an area where rock for foundations is too deep to be reached; and bank cutting endangering larger structures is common on the Salinas River.

The engineering design is handled by the County Road Commissioner and his staff while the field operations are directed by L. Camany, County Bridge Superintendent. He ordinarily employs from five to ten men and has been so successful in the retention of his men that some of them have been in the department almost as long as its superintendent.

The organization utilizes a ½-yard P&H machine for which a dragline and clamshell bucket are available as well as a shovel attachment. Swinging steel leads 30 feet long are used with either a 2,400 or 3,800-pound drop hammer to drive the timber or concrete piling on which all bridges constructed in the central valley have to be supported. Concrete piles are usually cast in the central casting yard, though sometimes at the bridge site.

A bridge of rather unusual design was completed by this organization

(Continued on page 85)



C. & E. M. Photo
At the small asphalt plant in the county yard, pre-mixed patching material is prepared for the maintenance of Monterey County roads. The railroad crane serves both asphalt plant and concrete-slab casting yard.

Portraits in Print

By BILL QUIRK

More Contractors Will Be Needed, Says Edmund A. Prentis of New York

SIX months after the end of the war there will not be enough contractors and construction men to go around, in the opinion of Edmund A. Prentis, Jr., Chief Engineer and member of the firm of Spencer, White & Prentis, Inc., engineers and contractors with headquarters in New York City. Visualizing a great boom in the construction industry, this veteran constructor believes the demand for capable contractors will far exceed the available supply.

"Only a quarter of the required effort has been put into public and private construction during the last fifteen years," says Prentis. "Going back even before the war, the first effects of the depression were beginning to be felt in the construction industry by 1930, and since then thousands of worthwhile projects have been laid aside or postponed until now the urgent need for such construction can no longer be sidetracked. The war also has produced a desolated world that needs to be rebuilt. Seabees and Engineer troops have a vocation waiting for them in construction when they get their discharges; their training can be put to excellent use in the busy years ahead."

As he spoke, the 62-year-old mining and civil engineer with an international reputation strode vigorously up and down his spacious office. Edmund Astley Prentis, Jr., has led an energetic life in following his profession to the remote corners of the world, and his restless activity has not tapered off with the years. The war machine, instead of retarding the business of his company in fields afar, made insistent demands on its services for civil and military works, not only in widely scattered parts of this country but also in the West Indies and in distant Iran.

Prentis has personally initiated these projects with the same enthusiasm he felt when as a young mining engineer he sailed for Latin America to begin his career. Instead of the peaceful steamer voyage on which he then embarked shortly after graduation from Columbia University in 1906, Prentis flew half way around the world in a tense flight with the Army Transport Command early in 1942 over territory partly under attack by enemy aircraft.

Engineer and Traveler

"Ted" Prentis, as he is called by his associates, is a kindly looking man of about average height and weight, 5 feet 8½ inches tall, weight 160 pounds, with brown eyes, gray hair, and skin tanned by the sun. His self-assured manner bespeaks the success that has come to his well known firm. Years of lecturing at engineering colleges are reflected in the precise, cultured tones of his voice. Around the office are the hallmarks of the traveler: a globe on the bookcase; maps, ancient and modern, hanging on the wall; on his desk as a paper weight lays a chunk of mineral containing 16 per cent pure ruby silver from a Peruvian mine high in the Andes mountains. Behind the desk hangs Charles Robert Patterson's well known painting of South Street along New York's waterfront in 1893, showing a long row of sailing ships moored to the piers with their bowsprits reaching half-way across the street.

"My father often took me to that very place," mused Prentis. "I was ten years old at the time of that picture, and the sight of those great full-rigged sailing ships with their bowsprits towering 40 feet or so above the street as my father and I walked beneath them made a deep impression. There it was, I believe, I got my incentive to travel."

Born in New York City, young Prentis had a typical public-school education, but while in high school he won a scholarship to Hamilton Institute, a small military preparatory school in New York City, where he received a sound classical education. His mother, who was born in Boston, hoped that after graduation he would go to Harvard and become either a doctor or a clergyman, but the family fortune at that time was at a low ebb, and going away to college was too expensive. Prentis, moreover, had been admiring for some time the big light blue "C" worn by Columbia athletes around town, and managed to convince his mother that that was where he wanted to go.

Roar, Lion, Roar

After interviewing the youth and discovering his boyhood and adolescent interests in carts and toy trains, building games, collections of rocks and minerals, and a taste in literature that ran to such works as Richard Harding Davis' "Soldiers of Fortune", a wise counsellor at Columbia turned to his mother and said, "Mrs. Prentis, your boy should enter the Columbia School of Mines".

"Such was my accidental entry into the engineering profession," Prentis reminisced with a smile, "and although that course had the reputation of being the most difficult in the University it was a lot of fun, and during those years I made many of my dearest friends. There I met Charlie Spencer, now Vice President of our company, while

Edmund A. Prentis, Chief Engineer and Secretary of Spencer, White & Prentis, Inc., New York City.

Lazarus White, our President, was a Columbia grad a few years earlier. Columbia University, next to my fam-

(*Continued on next page*)

TOUGH WAR EXPERIENCE
CONDITIONS EQUIPMENT FOR THE PEACE

Before the war, Standard Steel's Paving Plants made outstanding production records throughout the country in bituminous road construction. With war, this equipment has played and is playing an important role in the building of many, many airports, both at home and abroad. Performance under the toughest kind of operating conditions has proved the efficiency of this equipment. Not satisfied, however, Standard Steel engineers have plans, already past the drawing board stage, for increasing even more the effectiveness of these great paving plants. It will behoove contractors to keep an eye out for Standard Steel's post-war line of road machinery.

OTHER STANDARD ROAD CONSTRUCTION EQUIPMENT: ROLLERS, SUBGRADERS, BATCHING PLANTS, DRYERS, FINISHERS, BROOMS

STANDARD
STEEL CORPORATION
General Offices and Plant 5001 South Boyle Avenue
Los Angeles 11, California

Contractors Needed, Says Edmund Prentis

(*Continued from preceding page*)

ily and my close associates, has ever been my great interest."

In the Mines

Soon after graduation and still only 22, Prentis left the United States for a job in Mexico. After a year he left that for a $150-a-month job to take charge of a mine in Peru, where he lived all alone, but for Peruvian and Indian mine workers, in Morococha, 100 miles east of Lima, at an altitude of 15,000 feet. There he stayed until November, 1907, when a feeling of homesickness resulted in a sudden return to New York.

But the lure of the open spaces was too strong, and the next few years found the young mining engineer working successively in an Arizona copper mine, a gold mine in Candor, N. C., and finally back to Mexico again, first as superintendent of the San Carlos mine at Taviche, Oaxaca, and then as shift boss in the mill at a gold mine in Chihuahua.

"We had a great record of efficient results at this mine, doubling production and halving the costs," said Prentis, "until November, 1910, when the Madero rebellion broke out. Our operations were stopped and I returned to the United States with no little trouble. After a few months, things quieted down and I went back to Mexico, this time to a mine in Ventanas, Durango. When the Orozco revolution flared and the shooting got too close for comfort, I returned to New York in April, 1912, and decided to stay there."

Learning Contracting

The era of subway construction in New York City was in full flower, and Prentis got a job as laborer with a contractor who was building a section of the Broadway line. His job was underpinning buildings adjoining the subway cut. After eighteen months he became a foreman, and working with him on the same project was his former Columbia associate, Charles Spencer. In 1914 a contract was let for the construction of the difficult William Street line, through a narrow street bordered with tall buildings in congested downtown Manhattan. The original plans in 1900 called for a subway under this street, but the property owners, believing the construction impossible, had secured an injunction against the building of the subway. When the second set of subways was built by the City of New York in 1914, the only possible location was under William Street.

Managing Engineer for the contractor was Lazarus White, who picked Prentis to do the underpinning because of his experience with shafts, tunnels, and subways, and his knowledge of underpinning. The work was a great success and within a couple of years Edmund A. Prentis and Lazarus White completed their first book together, "Modern Underpinning". The two also took out patents on two inventions; one was a method of underpinning with piles called the Pretest system, and the other was a patent to underpin a building during its erection with concrete and steel foundation piles called Pretest foundations.

Their next job was on the construction of Camp Meade during the first World War. After that, Prentis enlisted in the Navy and served as deck ensign for a year. When the war was over, he and Lazarus White talked about going into business together.

Spencer, White & Prentis

"One day at lunch in March, 1919," said Prentis, "Lazarus said to me, 'Teddy, you put in whatever money you have and I will put in whatever money I have and we will start our company.' 'All right, Lazarus', I replied, 'and I think Charlie Spencer would be a good partner.' He agreed and the next day Spencer, White & Prentis was born, Charlie Spencer and I flipping a coin to decide which name should come first. For euphony it was agreed that Lazarus White's name should be in the middle. We had $30,000 capital with which to start our first contract, building foundations for the Kerr Steamship Building."

The new company got off to a good start in the Golden Twenties and its prosperity increased during the boom of that decade. By 1925, Spencer, White & Prentis had grown to be one of the larger construction companies and one with a real engineering reputation. Several sections of the Eighth Avenue subway in New York were constructed at this time, as well as foundations for great skyscrapers and power stations.

Interesting interludes for Prentis during this period included a journey to Mexico as a consultant to the Mexican government on foundation problems, and a hurried trip to Miami, Fla., to save the newly built 27-story Dade County Courthouse which had settled 6 inches in the soft aeolian limestone. The Pretest system of underpinning was used and permanently stopped all settlement.

Early in 1922, when he was 33, Edmund A. Prentis married the girl whom he had met twenty-two years before when he was a military cadet in prep school. They have one son, Ned, 21-year-old corporal in the U. S. Engineer Corps in China, holder of three ribbons and a battle star.

Depression Days

During the depression decade, 1930-1940, Prentis and White brought out another book, "Underpinning", which has received the comment of the "only engineering book written without a paste pot and scissors, and where the authors describe their mistakes". This work has been translated into Russian and Japanese, and with another book, "Cofferdams", by the joint authors, has received worldwide attention.

"At this time the great building contractors had very little work," recalled Prentis, "and in order to find work for our men and keep our company together we began to look further afield for jobs. In 1932 we submitted a bid to the U. S. Engineers for Lock No. 6 at Trempealeau in Wisconsin on the upper Mississippi, and to our great surprise we were the low bidder at a price of $1,200,000. We subsequently received other lock and dam contracts on the river, including the contract for the dam at Alton, Ill., for $6,000,000 which we built with two other contractors, the George A. Fuller Co. and the Turner Construction Co.

"Fifty-two contracts involving cofferdam work were active on the Mississippi at that time, and because the projects were under supervision of the Army Engineer Corps for the Public Works Administration of the Federal

(*Continued on next page, Col. 4*)

Now... THE GREAT

ERE they are—four great new Lorains we've been waiting to tell you about! This brilliant, hard-hitting "41" series of machines combines 50 years of shovel and crane engineering experience with the valuable new things we've learned building for war. They're heavier, new in performance, greater in capacity, easier to service, crammed with profit-making new features. They're the best we've ever announced—and best of all, they're HERE—ready and raring to go into your postwar business!

Every one of these four new performers—the Lorain 41 Crawler, the Moto-Crane 414, the Moto-Crane 416, and the Self-Propelled Crane 414—has its own long list of great features. Any one of these machines is good news by itself. But Thew now gives you all of them at once—so you may have the one that's best in mounting, boom equipment, speed and basic efficiency for your job.

Features, Features and More Features!

Thew engineers spared no effort—left no spot untouched—in drawing the plans for these new beauties. Here are just a few things they did for you!

A brand new, long life, shoe type swing clutch that gives far smoother action and many times the usual service life. Greatly increased capacities (ask for the new ratings.) ¾-yd. chain crowd shovel. Dual boom stop on all crane booms . . . a double safety feature. Two-piece, all-welded, pin-connected, fast-assembly boom interchangeable for all crane, clam and drag work. All available with gas, diesel or electric power.

As soon as you see these new Lorains in action, you'll want to put one to work! Check the features and capacities we have room to give you here—then see your nearest Lorain Distributor for the complete facts!

GET THE FACTS AND YOU'LL GET A... "41"

SEE YOUR LORAIN DISTRIBUTOR NOW!

Production Starts On New Lubricator

As a result of an exhaustive analysis of present and past methods of lubrication as practised by contractors, Federal, state, county, and municipal maintenance departments, Balcrank Inc., 1200 Brookins St., Cincinnati, Ohio, has developed a new fast lubricator for construction equipment. This new lubricator may be used on all types of machines, regardless of the varied types of fittings.

Chief among the features of the new Minit Lubricator, which went into quantity production last month, is the Padl Pak tamping blade which eliminates air pockets without the use of bleeder valves. This patented device assures 100 per cent delivery of grease to the fitting at all times, it is stated. Another feature is the "jiffy change" adapter, which utilizes a universal swivel as an integral part of the hose line, thus permitting an adapter change in seconds to take care of button-head, hydraulic, or pin-type fittings.

The new Balcrank Minit Lubricator is designed for use on all types of construction equipment, regardless of the various types of lubrication fittings.

The all-weather construction of the Minit Lubricator seals out all rain, moisture, dirt, and dust, while its 30-pound capacity takes a full 25-pound can of grease and pumps the container empty without a sputter. A special mounting bracket is provided as an accessory, which makes it possible to mount the lubricator on any machine ready for use at any time.

Complete information regarding this new lubricator may be secured direct from the manufacturer.

Torches and Heaters For General Service

The complete line of Hauck heating and melting equipment, including torch-flame burner equipment, fire guns, weed burners, lead and compound melting furnaces, steam thawers, salamanders, concrete heaters, ground thawers, water heaters, and tar and asphalt melting kettles, is described and illustrated, with tabulations of sizes and prices, in a new 12-page catalog No. 1039. Copies are available direct from Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N. Y.

NEW LORAIN "41" SERIES!

LORAIN 41, 2-SPEED, CHAIN DRIVE CRAWLER

Entire mounting is new, longer, wider, heavier.
30" swamp type treads standard.
Two travel speeds standard — ¾ and 1⅞ MPH — either direction.
Steers from cab in any swing position.
New, positive 4-way ratchet and pawl tread and travel lock.
Greater crane capacities.
Greater clamshell and dragline bucket capacities.
Convertible to shovel, crane, dragline, clamshell, backdigger.

The Three New Rubber-Tired Lorains

MOTO-CRANE 414 (4-WHEEL DRIVE)

Greater crane capacity—now 20 tons.
Carrier specially designed for shovel and crane loads.
Ten forward speeds, 1 to 28 MPH. Two reverse speeds.
Six wheels. Four dual-tire rear wheels powered by two worm driven axles.
Air brakes on four rear wheels.
Convertible to shovel, crane, dragline, clamshell, backdigger.

MOTO-CRANE 416 (6-WHEEL DRIVE)

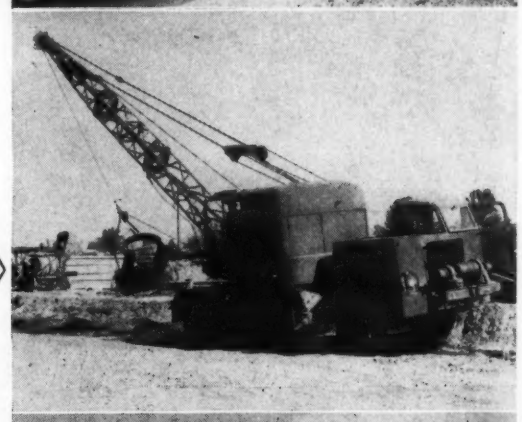
Here, for the first time commercially—the heavy-duty rubber-tired Moto-Crane that was developed for Military Service and came out with top honors for stamina and performance!

20-ton crane capacity.
Six-wheel drive. All axles double-reduction drive.
Eight speeds forward, 1 to 31 MPH. Two reverse speeds.
Power-assisted steering.
Air brakes on all six wheels.

SELF-PROPELLED CRANE 414

20-ton crane capacity.
Single engine, single operator.
Six wheels with power on four worm driven rear wheels.
Four travel speeds in both directions, 1 to 7 MPH.
Simultaneous hoist, swing, travel and boom derricking.
Air brakes on four rear wheels.
Air power, finger-tip steering.
Dual-tired front wheels, differential type to eliminate scuffing.

THE THEW SHOVEL COMPANY • Lorain, Ohio



Reg. Trade Mark
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CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

Contractors Needed, Says Edmund Prentis

(*Continued from preceding page*)

government, the contractors' costs were known on each job. We were told that the contractors lost money on twenty-six of those contracts, thirteen broke even, and only thirteen others were successful financially. Obviously, that is a sorry record for contractors as a whole, but fortunately our five contracts ended in the black.

The construction of the Sixth Avenue subway in New York from 8th up to 53rd Street was a help to contractors in the late 30's before the war boom came along to end the depression. Spencer, White & Prentis secured the last contract in 1937 to build the difficult section from 8th to 18th Street at a cost of about $7,000,000. In 1938 this company, together with W. E. Callahan Co. of Houston, Texas; Winston Bros. Co. of St. Paul, Minn.; and Foley Bros. Inc., of Pleasantville, N. Y., formed the Pleasantville Constructors, Inc., and secured a $10,500,000 contract on the Delaware Aqueduct for the City of New York, to drive 7 miles of tunnel under the Hudson River from Chelsea to a point north of Newburgh, N. Y.

Record Tunnel

The four companies spent nearly $1,500,000 in purchasing equipment, installing it, laying out the work in a six month's preparatory period, and then commenced driving the tunnel. Starting in September, 1938, those 7 miles were driven from two shafts and four headings in exactly one year, at an average rate of 33 feet per heading per day, a high rate of progress for an 18-foot-diameter tunnel. The following year the tunnel was lined with concrete.

Towards the close of the decade, Spencer, White & Prentis completed three large foundation jobs, each unique in its class. One of these was the new Criminal Courthouse and jail on Center Street, New York City, built on the site of the bed of old Collect Pond. The pond bottom was 40 feet below the ground, and solid rock was another 100 feet below that. One contractor had already spent over a million dollars on this foundation but was compelled to abandon it with very little accomplished. The work was completed in about eight months for less than $2,500,000, despite the peculiar difficulties.

The second unusual contract was the successful underpinning of St. Joseph's Cathedral in Hartford, Conn., which was settling on its soft clay foundation, with hardpan 50 feet below. The final large contract in the pre-war period was a 16-story warehouse in the Brooklyn Navy Yard, where rock lay below 150 feet of clay and sand with intermediate layers of heavy boulders. The use of "drilled-in" caissons solved this difficult foundation problem.

World War II Contracts

In July, 1940, Prentis was hastily summoned to Washington to receive a Navy Department contract amounting to $80,000,000, in association with two other companies, Foley Bros. Inc., and Merritt-Chapman & Scott Corp., for two great graving docks at Philadelphia to accommodate the largest battleships, another at Norfolk, Va., together with a destroyer base, and other appurtenant items. For his part in this important war work Prentis wears in his buttonhole a Navy citation for meritorious civilian service.

To furnish aid to Russia in the early days of the war, the U. S. Army in October, 1941, began planning extensive construction in Iran to facilitate the shipment of supplies to the hard-

(*Concluded on next page*)

Contractors Needed, Says Edmund Prentis

(*Continued from preceding page*)

pressed Soviet Union. The Army was not organized at that time to do the job itself and, in addition, as this was still prior to Pearl Harbor, the work had to be a civilian enterprise. Accordingly Spencer, White & Prentis, together with Foley Bros. Inc., received a joint contract to build wharves, highways, railroads, camps, etc., in the Near East at the head of the Persian Gulf.

"Soon after war was declared in December," said Prentis, "I felt that I was drafted to lead this expedition into the cradle of civilization. So in January, 1942, I flew 12,500 miles across ocean, jungle, and desert to spend four months in Iran directing the early phases of construction. We brought over $15,000,000 worth of machinery and equipment, 1,000 workers, and recruited 20,000 Persian laborers. We lost eleven men on the way over when a ship was torpedoed. The construction was done under the supervision of Army Engineers, and by the end of the year the piers were completed and, with the rest of the work well advanced, the Army took over the project with Engineer troops and the civilians returned home.

"Our men suffered during the Persian summers when 130-degree temperatures are normal, and when the thermometer drops only to 110 or 120 degrees at night. We put auxiliary radiators on our equipment to take care of the high temperatures. We found the younger natives, those between fifteen and twenty, who worked for us to be particularly adaptable, eager to learn, and willing to work after they were trained. However, no part of the world would be more fruitful for sanitary and educational efforts than Iran, where so many people are ignorant, starved, and subject to disease.

"We take particular pride in that job," recalled Prentis, "especially after Stalin told Lieut. General Brehon B. Somervell at Teheran that this line of communication, starting at Iran, brought desperately needed aid to Russia at Stalingrad just in the nick of time, and was perhaps the straw that prevented the camel's back from breaking."

After the work in Iran, the joint contractors went to the Bahamas and built two huge airfields. Following that, Spencer, White & Prentis, together with the Turner Construction Co., began building a fleet of 105 oil tankers worth $300,000,000 at a Mobile, Ala., shipyard. This ship building will end in December.

Work and Hobbies

In the meantime, this great organization is occupied with foundation work for civil construction in all parts of the United States. Its busy Secretary and Chief Engineer is also director of several mining companies, writes many technical articles for engineering publications, has served as President of the American Standards Association, received the New York Moles award as Engineer of the Year in 1941, and still finds time to enjoy his hobby of collecting paintings and prints. At present he is eagerly awaiting the return of his son Ned from the Far East when he will resume yatching, a favorite sport of his youth.

His associates in the company have given perhaps the best description of Edmund Astley Prentis, Jr., in a foreword to his book in which they describe him as "a mild man of fierce loyalties". His family, his college, his class, his friends, his country will confirm that phrase.

Anti-Diversion Bill Up Before Two States

In November, voters in Pennsylvania and Kentucky will be given an opportunity to pass constitutional amendments prohibiting gas-tax diversion from highway uses. It is to be hoped that these and all other states will soon make unlawful this insidious practice of diverting to non-highway purposes the taxes collected from highway users.

In a recent issue of "Down the Road", Charles M. Upham, Engineer-Director of the American Road Builders' Association, points out that getting the anti-diversion amendment on the ballot is a step in the right direction, but action cannot stop there. To preserve highway funds for the purpose for which they are intended, the amendment must be passed, which requires a majority of all votes cast in an election. Many people never bother to mark "little ballots". Therefore an aggressive campaign to acquaint the citizens with the importance of the measure must be carried on. Motorist may deplore the condition of the highways due to tax diversion, but they must be reminded that if it continues it will be their fault.

With so gigantic a highway program waiting to be started, and our roads so badly in need of reconstruction and improvement, every citizen concerned with the welfare of highway transportation in this country should get behind the anti-diversion campaign and give it a boost. As Mr. Upham put it, "That is the way to disarm this highway robber".

Air for Your Jobs

The new Catalog 45, just issued by Schramm Inc., West Chester, Pa., covers the complete line of Schramm portable and stationary air compressors now available for distribution. Included in the wide variety of models and mountings is the self-propelled crawler type which is built in several sizes for either gasoline or diesel-engine drive. Features are described and specifications given, while color illustrations depict the various styles and models.

Copies of this new Catalog 45 may be secured by interested contractors and state and county highway departments direct from the manufacturer.

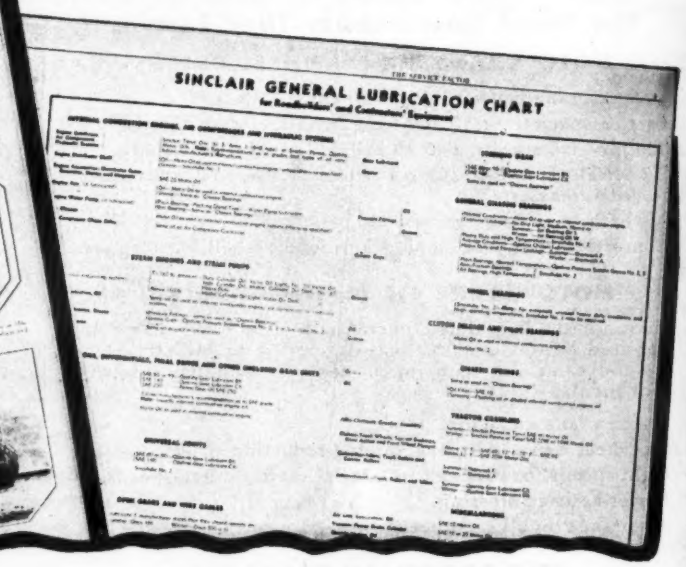
LANSING

WHEELBARROWS
CONCRETE MIXERS
DRAG SCRAPERS

Lansing Company
LANSING, MICH.
SINCE 1861

Here's SIMPLIFIED LUBRICATION for ALL Your Equipment...

THIS CHART TELLS YOU HOW



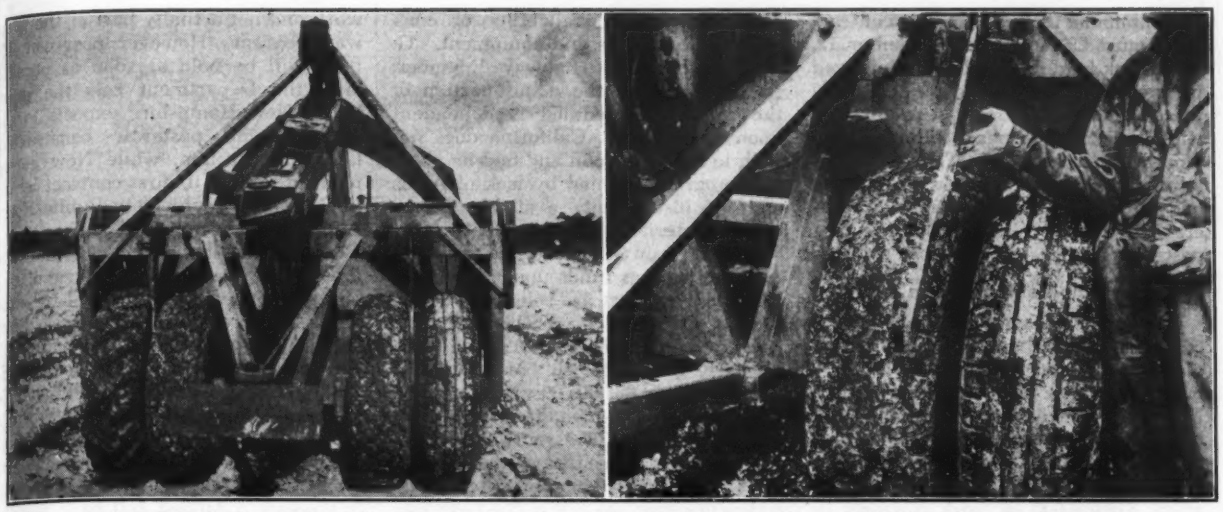
In helping to simplify lubrication for widely diversified equipment of the Armed Forces, Sinclair developed a system that eliminates headaches in the lubrication of roadbuilders and contractors' equipment. Sinclair Charted Lubrication makes it easy to set up simplified lubrication for *all* equipment.

Lubricant inventory is narrowed down to a comparatively few, well chosen, generally available oils and greases. Errors of application can be minimized, lubrication and maintenance costs can be reduced, and life of the equipment extended.

Wouldn't the Sinclair Lubrication Chart be of valuable aid in your operations? Write for copies—no charge.

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.



An ingenious device, easily made, prevents stones becoming lodged between tires. At right, a close-up of the bar.

Dislodging Stones Between Dual Tires

A simple device that can be made at a cost of less than $5.00 has been saving thousands of dollars annually by protecting dual tires on Army earth-moving scrapers and trucks from damage by rocks and sharp objects becoming wedged between the tires. The gadget, which was invented by Warrant Officer Heimo Raski, consists of a 3¼-inch metal bar attached to the scraper frame. The bar is inserted between the tires and rests on the wheel hub. When the vehicle is in motion, the device tosses rocks clear of the tires. The bar can be used on truck tires by adjusting it to the axle.

This invention first came out in July, 1943, when Raski was with the 46th Engineer Construction Battalion on Kiriwana Island in the Pacific. The Battalion, which had the gadget accredited by general headquarters in the Pacific, used it to protect tires from coral rock on the atolls. Since the original plan was filed, this tire-conservation device has been adopted by Army commands all over the Pacific.

Concrete and Aggregate Standards Issued by ASTM

A new volume, "Standards on Concrete and Concrete Aggregates," has just been issued by the American Society for Testing Materials. In addition to all of the ASTM specifications and test methods covering concrete and concrete aggregates, this compilation gives numerous other pertinent standards covering cement, concrete reinforcing, preformed expansion-joint fillers, and sieves for testing purposes.

In the section on aggregates there are two specifications covering light-weight aggregates for concrete, fifteen test methods (abrasion, sampling, soundness, specific gravity, absorption, structural strength, unit weight, etc.), and three sets of definitions. There is a specification for ready-mixed concrete and sixteen test methods on concrete (air content, compressive strength, flow, sampling, slump test, volume change, etc.). Concrete curing materials are covered in four standards.

Copies of this publication of over 150 pages may be secured direct from American Society for Testing Materials Headquarters, 260 So. Broad St., Philadelphia 2, Pa. Price: $1.50 per copy.

Robins Conveyors Acquired by Hewitt

Hewitt Rubber Corp., Buffalo, N. Y., has announced the acquisition of a controlling interest in Robins Conveyors Inc., of Passaic, N. J. Thomas Robins, Jr., President of Hewitt Rubber Corp., in addition to directing the management of Hewitt since 1936, has been Chairman of the Executive Committee of Robins Conveyors for the past five years so that there has been a close association between the two companies.

The acquisition of approximately 90 per cent of Robins Conveyors stock by Hewitt makes this manufacturer able to engineer and build all parts of belt conveying systems under single management and responsibility.

Compact—Powerful—Safe

STANDING ROOM ONLY FOR DURATION

Beebe Bros. All-Steel Hand Hoists carry the highest resale value of any piece of equipment in the world. If you have one not in use, sell it. Many more than are available are urgently needed.

BEEBE BROS.
2724 6th Ave., So., Seattle 4, Wash.

Pacific CRUSHERS deliver MORE Finished Product at LESS COST and there's a size to meet YOUR requirements

PACIFIC JAW CRUSHERS are in successful service in hundreds of mines, quarries, and rock plants, and are widely used on road making and construction jobs. They are designed with the minimum number of rugged parts including manganese steel jaw plates—all easily replaceable in the field—and they have no equal for low-cost, uninterrupted service in the toughest operations.

PACIFIC JAW CRUSHERS operate on the force-feed principle, with an ingenious design which actually gives *two* crushing strokes for *each* turn of the shaft. The crushed material passes through a sized opening at the bottom to insure a uniform product, and adjustment of the size of the product may be made while the crusher is in operation.

There are six sizes to choose from, each made of the most durable materials to provide low-cost, long-life service, with minimum down-time for adjustments, repairs, or replacements. Prompt deliveries on all sizes are again possible.

Inquiries should give details of your crushing problems so that we may give specific recommendations to solve them. No cost or obligation is incurred.

ALLOY STEEL & METALS CO.
1862 East 55th Street
LOS ANGELES 11, CALIFORNIA

State Road Work Ready for Action

A Few States Have Begun Post-War Programs; Most Are Set When Materials And Labor Are Available

✦ AUGUST 14, 1945, marked the end of organized fighting in the second phase of the World War, and September 1, 1945, the formal surrender of the Japanese imperial forces. Therefore either of those dates might well mark the beginning of the post-war era. However, as far as the interests of the road-building industry are concerned, the Post-War Highway Act of 1944 could not become effective until one of two alternative conditions named in the Act was met. According to the Act, it becomes operative in the first post-war fiscal year, defined in the Act as "that fiscal year which ends on the June 30 following the date proclaimed by the President as the termination of the existing war emergency . . . or following the date on which the Congress by a concurrent resolution of the two Houses finds as a fact that the war emergency hereinbefore referred to has been relieved to an extent that will justify proceeding with the highway construction program provided for by this Act".

So many critical factors are involved in a proclamation by the President of the formal end of the war that it seems improbable that such action will be taken for some time. However, on September 17, the Congress, by concurrent resolution, gave the green light to the post-war highway construction program.

During the war, the unexpended Federal-Aid balances, authorized previous to 1944, were frozen. These amount to about $106,000,000. Thomas H. MacDonald, Commissioner of Public Roads, on September 13 announced removal of the war restrictions on this Federal-Aid money, and PRA District Engineers may now approve immediate construction of programmed projects to be financed with these funds.

The wartime restrictions on highway construction were removed by the War Production Board September 7. Construction of 316 miles of Federal-Aid highways, costing $16,300,000, and under way when deferred, may now be resumed, and work on an additional 1,387 miles of Federal-Aid highways, costing $43,000,000 may begin.

Since the Public Roads Administration, the American Road Builders' Association, and practically the entire press of the industry have been urging state highway departments to hasten their plans for post-war highway work, to be ready for the coming of V-Day, and that day has arrived in the public mind, if not officially, CONTRACTORS AND ENGINEERS MONTHLY polled the states for statements on their readiness to start post-war highway construction at the present time.

Some Contracts Already Let

Nine states reported some contracts let within a few weeks of the termination of hostilities. On August 17, Connecticut called for bids to be opened September 4 on 28,000 feet of grading and drainage on the Wilbur Cross Parkway, with other sections to follow as soon as the WPB rescinds the restrictions on highway construction. Delaware's first letting for post-war highway work was on August 29. In Maine, bids on five bridges were advertised on September 5. The first post-war letting in Massachusetts was on September 6, with several projects within the $100,000 category ready to go immediately.

Montana let its first post-war contract on August 29, while on September 12, New York held its first letting, followed by another on September 26. Ohio reported its first letting on August 31, with additional lettings scheduled semi-monthly thereafter. In Texas the first letting was on August 21, with the second on September 25, all on old Federal-Aid funds. Virginia held its first post-war letting on September 6.

Plan Lettings Soon

Of the forty-two states replying to our question, twelve announced definite plans for the start of their highway programs as soon as restrictions were lifted, Federal-Aid money made available, and the labor situation improved.

The California Division of Highways reported that, of its $115,000,000 program, $79,000,000 of work is ready in prepared plans and specifications, but that the date of the first letting is dependent on the rapidity and degree of absorption by private industry of labor released from war plants and military service, and the availability of construction materials and equipment. G. T. McCoy, State Highway Engineer, stated that since the major portion of the program scheduled is dependent upon Federal Aid, California does not wish to start too soon and find its post-war program stymied by lack of funds and/or insufficient available manpower, materials, and equipment.

Florida is in a position to let contracts as soon as funds under the Post-War Highway Act are released. Idaho has not definitely established the date of its first letting but expects it to be in the early spring of 1946. Maryland has approximately $6,000,000 worth of projects ready to go, some of which will be let this autumn. The remainder of its post-war program is awaiting Public Roads Administration approval and official notice that we are in the post-war era.

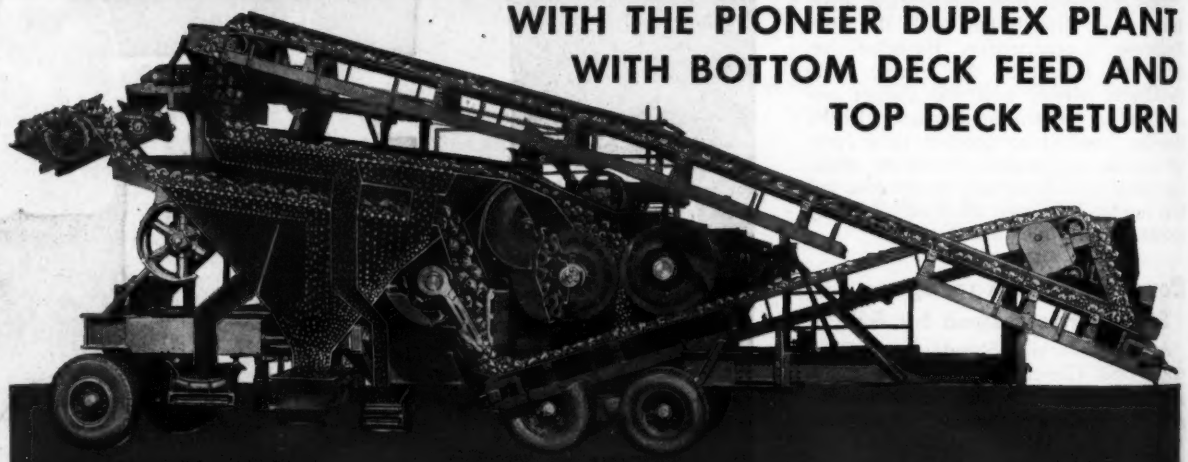
Although Missouri took bids on August 17 on approximately $500,000 worth of work, Chief Engineer C. W. Brown considers this mostly emergency work and not actually part of the post-war program. However, post-war lettings will be held as soon as possible after the Department gets the green light. New Hampshire expects to advertise some post-war construction later this autumn, while New Jersey planned to hold its first contract letting in September, subject to Public Roads Administration approval.

North Carolina expected to hold its first letting as soon as clearance of certain projects could be secured from the PRA. However, W. Vance Baise, State Highway Engineer, reported that it will be necessary to secure considerable additional engineering personnel to handle the construction before North Carolina can initiate much work. Every effort has been made to obtain more engineers for field work, without much success up to the end of August, but hope was expressed that conditions would improve and more engineers would be available soon.

Oregon stated that its first post-war

(*Concluded on next page, Col. 4*)

WINSTON BROTHERS . . .
Make The MATERIAL Meet



WITH THE PIONEER DUPLEX PLANT
WITH BOTTOM DECK FEED AND
TOP DECK RETURN

HERE'S WHAT THE PLANT HAD TO DO

THE SPECIFICATION

SURFACE COARSE		COVER AGGREGATE	
PASSING	%	PASSING	%
1"	100		
¾"	85—100	½"	100
No. 4	45—65	⅜"	90—100
No. 10	30—50	No. 10	0—5
No. 200	5—10	No. 200	0—2

Liquid Limit—Maximum allowance 35.
Plasticity Index—Maximum allowance 6.

THE TEST OF THE GRAVEL PIT

3"	69%	No. 4	32.4	Liquid Limit—test 35.
1"	53.5	No. 10	28.9	
¾"	49.0	No. 40	25.0	Plasticity Index—test 17.
		No. 200	17.0	

HERE'S HOW THE PLANT DID THE JOB

To perform all these tasks efficiently and at low cost, a Pioneer Vibrator Duplex Plant was selected. It is the only standard gravel plant that could make the pit fit the specification because of its exclusive "Bottom Deck Feed."

In the Pioneer "Bottom Deck Feed" plant, the pit run material is screened on the bottom deck so the pit fines, of which there was an excess, were removed through the sand screen.

Crushed material is screened on the top deck so that by using a ⅜" opening in the first half of the top deck and a ¼" opening in the middle deck it was possible to produce "stone chips" and save the crusher fines in the coarse aggregate.

To make this material meet the specifications, Winston Brothers ordered a Pioneer 48-V Duplex Crushing Plant. They found it was the only standard gravel plant that could make the material meet the specifications—because of its exclusive "Bottom Deck Feed".

They fed the pit material onto the bottom deck and rejected the pit fines through the sand screen. Crushed material was returned to the top deck and crusher fines were mixed with the coarse aggregate. By using ⅜" screen in the first half of the top deck—and a ¼" screen in the middle deck, it was possible to produce "stone chips".

Oversize from the bottom deck was crushed in the jaw crusher and returned to the top deck. Oversize from the top deck was crushed in the roll crusher.

Thus Winston Brothers were able, in this portable plant, to crush oversize . . . reject pit fines . . . and produce surface coarse aggregate . . . and cover aggregates.

"Don't ask me, somebody down at the department hates women drivers."

Arc-Oxygen Electrode For Underwater Work

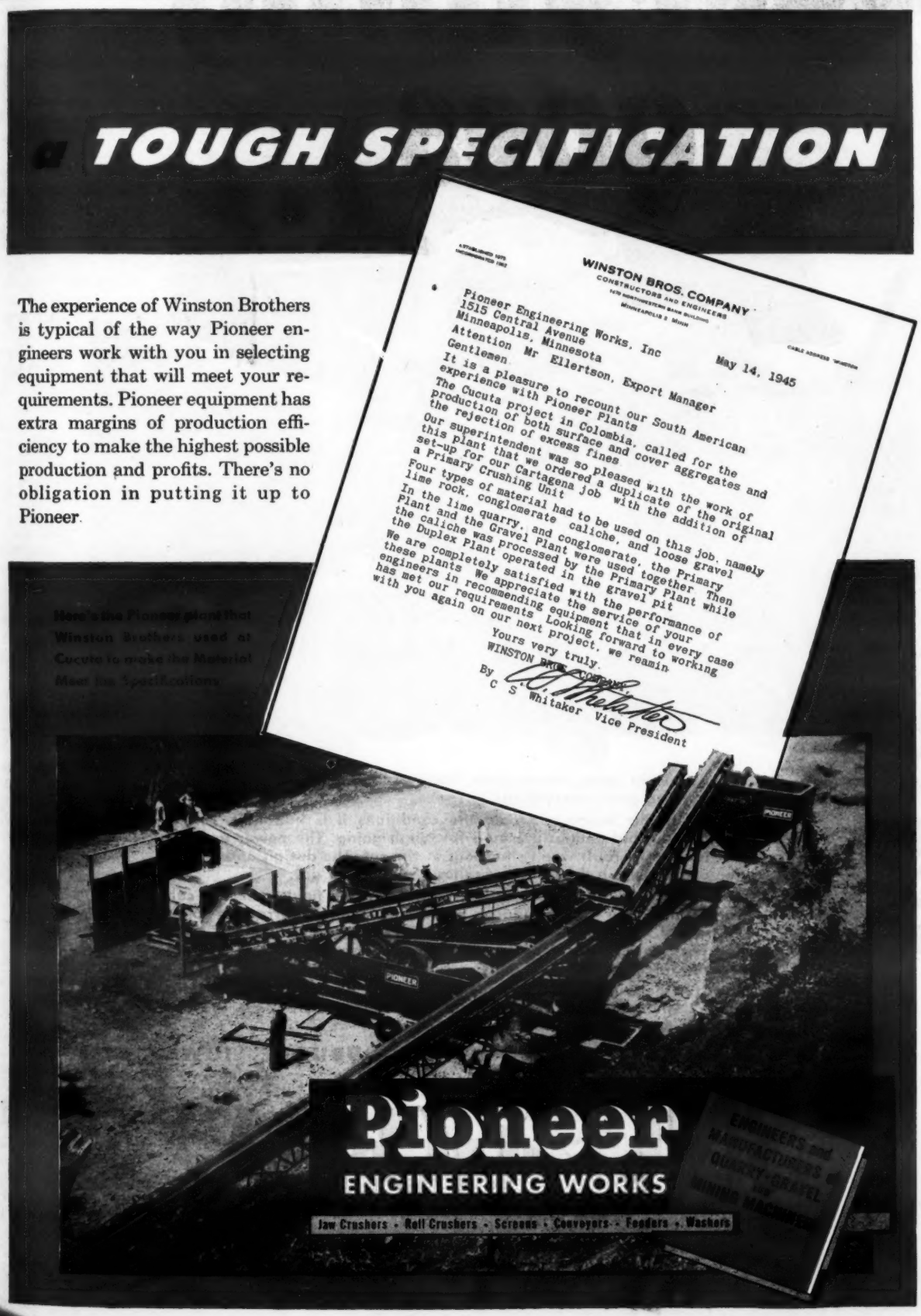
Murex underwater cutting electrodes, which until recently were manufactured solely for war purposes by the Metal & Thermit Corp., 120 Broadway, New York 5, N. Y., are now available for civilian use. This type of electrode, information about which has been restricted until now, is said to have been responsible for the great speed with which invasion harbors were cleared of sunken ships by Navy Salvage and Seabee forces. So fast is the underwater cutting process with these electrodes that ¼-inch steel plate has been cut at the rate of more than 5 fpm, it is stated.

The arc-oxygen electrode for underwater cutting, which performs two independent operations, utilizes the heating properties of an arc flame, ranging from 6,000 to 10,000 degrees F, for underwater kindling of steel plate, beams, or piling to the burning point. Into the molten steel thus produced, a jet of pure oxygen is injected to cut cleanly through the steel. Known as Murex C-T, this tubular electrode has an extruded and waterproofed coating and is supplied in one size only, 5/16 inch in diameter and 0.112 inch plus or minus 0.008 inside diameter. When in use, oxygen is passed through the tubular opening.

In tests, it is stated that Murex C-T tubular electrode shows average underwater cutting speeds ranging from 12 to 15 inches per minute for 1½-inch steel plate to 30 inches per minute for ¼-inch steel plate. It may also be employed for cutting non-ferrous metals and iron, or used in the open air for cutting difficult high-alloy steels.

For underwater welding, there is the Murex C-W, supplied in ⅛ to 7/32-inch sizes. It has a solid steel core and an extruded waterproofed coating. For general salvage operations, the 3/16-inch size is the most widely used, and is employed for welding plate from ⅛-inch to heavier thicknesses. This electrode can also be used effectively for underwater cutting of material up to ¼ inch thick.

Contractors and state and county highway engineers having underwater cutting and welding problems may secure further information on this new arc-oxygen type of electrode direct from the manufacturer.


a TOUGH SPECIFICATION
The experience of Winston Brothers is typical of the way Pioneer engineers work with you in selecting equipment that will meet your requirements. Pioneer equipment has extra margins of production efficiency to make the highest possible production and profits. There's no obligation in putting it up to Pioneer.
WINSTON BROS. COMPANY
CONSTRUCTORS AND ENGINEERS
Pioneer Engineering Works, Inc
1515 Central Avenue
Minneapolis, Minnesota
May 14, 1945
Attention Mr Ellertson, Export Manager
Gentlemen
It is a pleasure to recount our South American experience with Pioneer Plants. called for the The Cucuta project in Colombia, production of both surface and cover aggregates and the rejection of excess fines
Our superintendent was so pleased with the work of this plant that we ordered a duplicate of the original set-up for our Cartagena job with the addition of a Primary Crushing Unit
Four types of material had to be used on this job, namely lime rock, conglomerate caliche, and loose gravel In the lime quarry, and conglomerate, the Primary Plant and the Gravel Plant were used together Then the caliche was processed in the Primary Plant while the Duplex Plant operated in the gravel pit
We are completely satisfied with the performance of these plants We appreciate the service of your engineers in recommending equipment that in every case has met our requirements Looking forward to working with you again on our next project. we reamin
Yours very truly.
WINSTON BROS. COMPANY
By C. S. Whitaker Vice President
Here's the Pioneer plant that Winston Brothers used at Cucuta to make the Material Meet the Specifications
Pioneer
ENGINEERING WORKS
Jaw Crushers • Roll Crushers • Screens • Conveyors • Feeders • Washers
ENGINEERS and MANUFACTURERS of QUARRY-GRAVEL and MINING MACHINERY

State Road Work Ready for Action

(*Continued from preceding page*)

letting will be held about four weeks after the Congress releases Federal-Aid funds, while South Dakota reported on August 30 that a number of projects were ready to go and it hoped to have a letting within sixty days. Vermont expects to advertise some jobs as a feeler now that Federal money has been released, but reported lack of labor as a handicap. In West Virginia, contract lettings followed about two weeks after Federal funds were made available.

Awaiting Federal-Aid Funds

Eleven states reported that the letting date was contingent upon the raising of restrictions and the release of funds under the Federal-Aid Act of 1944. These states are Alabama, Georgia, Kentucky, Louisiana, Nebraska, New Mexico, Oklahoma, South Carolina, Tennessee, Washington, and Wisconsin.

Arkansas, Colorado, Illinois, Indiana, Kansas, Minnesota, and Pennsylvania stated that no date had been set for contract lettings.

State Action Needed

Mississippi reported that the State Legislature must convene to provide funds as this State could not now match its share of the Federal-Aid money when it is released by the Congress. Nevada stated that its first letting is dependent on the release of Federal funds and that no state funds are available for road construction. Rhode Island's post-war highway program is also waiting for the appropriation of funds by the Legislature.

Conclusion

From these reports, it is clear that, while a few states were prepared to launch their post-war road program immediately, most states were waiting for the lifting of restrictions, release of Federal-Aid money, larger supplies of materials, and improved labor conditions. The first two have been accomplished and materials are becoming increasingly plentiful.

However, the labor problem is still present. One state reported, "We are working for a very fine program but are rather fearful that the demands of labor for a 50 per cent increase over wartime wages and fewer hours will have a very dampening effect. As it is now, we have difficulty in getting contractors to bid at all".

Although speedy action has been taken to make possible an immediate start on our post-war highway program, the winter season will soon be here, and in view of that, plus the apparent difficulty of securing labor and the uncertainty of wage demands, it seems unlikely that the program will really get under way before next spring. The 1946 construction season, however, should see a large amount of highway work in full swing.

New Vice Presidents Of Hercules Powder Co.

Announcement has been made by the Hercules Powder Co., Wilmington, Del., of the election of William R. Ellis and Mahlon G. Milliken as Vice Presidents of the company. Mr. Ellis, who has been associated with Hercules since 1915, has been General Manager of the Explosives Department. Mr. Milliken also joined Hercules in 1915 and has been General Manager of the Cellulose Products Department since 1934.

At the same time, the company announced the election of Philip B. Stull, now a Vice President, Mr. Ellis, and Mr. Milliken as members of the Executive Committee.

Portable Compressor Described in Catalog

The new Blue Brute streamlined portable air compressor of 105-foot capacity is described and illustrated in a recently issued 4-page catalog. This compressor is made in two designs, 3-wheel mounted, in which the front wheel is caster-type, and 4-wheel mounted, and can be towed behind a light truck. It is available in two models: with a Continental F-266 H. D. gasoline engine with standard accessories, or with an International UD-6 diesel engine. Complete specifications are given in the catalog.

Copies of this descriptive catalog may be secured by writing to Construction Equipment Division, Worthington Pump & Machinery Corp., Holyoke, Mass., and mentioning this publication.

New Lincoln Office

The Lincoln Electric Co., Cleveland, Ohio, manufacturer of arc welding equipment, has announced the opening of a direct factory branch sales office in St. Louis, Mo. This new branch, under the direction of B. J. Brugge as Welding Engineer and District Manager of Sales and Service, is located at 4427 Manchester Avenue.

Catalog on Versatile Loader-Crane-Excavator

The Fleet Foot mobile self-powered unit designed to combine the functions of loader, crane, and excavator, together with many of the functions of a prime mover, is described and illustrated in a 50-page catalog just received. Featuring a 180-degree-swing boom, giving 90-degree swing on either side, this front-end Fleet Foot loader is reported to effect a saving in time, fuel, and machine wear, while two hoisting and two swinging speeds, independent of traction, give flexibility of operation. In addition, the Fleet Foot incorporates travel speeds up to 15 mph, eliminating hauling expense on an average trip to the job.

Interchangeable attachments for adapting the Fleet Foot loader to many types of road work, snow removal, and excavating are described and illustrated in the catalog, which also contains complete specifications. The back page describes briefly other equipment by the same manufacturer.

Interested highway engineers and contractors who wish copies of this descriptive catalog, JL-5, should write to the Jaeger Machine Co., 701 Dublin Ave., Columbus 16, Ohio. Just mention this review.

Snow! Light snow, heavy snow, lumpy snow, crusty snow, icy snow —everything goes—everything!

Look at this Snogo and note the conditions it is handling. This is tough going but Snogos are *built* for tough going. The power and the traction are there. It won't climb out of the cut. The design and operation are proved in thousands of miles of winter service.

Snogo picks up the snow and throws it into the fields where it can do no harm. No banks build up in ever deepening, narrowing lanes that delay traffic and endanger lives. The danger of "ice sheet" with its treacherous ruts is reduced. Winter business of small communities is maintained and children get to school *and back* safely.

How are your plans for the winter campaign for open roads? Are you planning safer highways—with Snogo? There is a size for every state, county or city budget. We will be glad to send complete details.

KLAUER MANUFACTURING COMPANY, DUBUQUE, IOWA

SNOGO A SNOGO For EVERY BUDGET

Earth Work Progresses At Anderson Ranch Dam

Methods of Placing the Compacted Fill for World's Highest Earth Dam; to Be Completed in 1947-48

ANDERSON Ranch Dam, situated on the South Fork of the Boise River about 80 miles from Boise, Idaho, is a zoned earth-fill embankment which, when completed, will be the highest rolled earth-fill dam in the world. Construction is being pushed to completion by Morrison-Shea-Twaits-Winston Co. under a contract with the U. S. Bureau of Reclamation. The original contract was awarded on August 4, 1941, and construction proceeded rapidly until December 26, 1942, when a stop order from the War Production Board prohibited all work except that essential to protect the part of the project already completed against undue deterioration. While this necessary work was being performed under a negotiated contract, a modified construction program was worked out which omitted the power house, spillway control gates, and the permanent outlet valve from the present project, but provided storage for 45,000 acre-feet of water by the end of 1945, 130,000 at the end of 1946, and full designed storage by the end of 1947. Under this program an 84-inch needle valve borrowed from Boulder Dam will be temporarily installed in the outlet works. This plan received the support of the War Food Administration and after considerable discussion the War Production Board approved the modified program and the present cost-plus-a-fixed-fee contract was executed November 13, 1943.

The normal flow line of the river at the axis of the dam is 3,865 feet above sea level, and the ultimate top elevation of the dam will be 4,206 feet, with the maximum water level 10 feet lower. The foundation excavation in the bed of the river increased the maximum height of the structure to 456 feet. During the 1945 construction season the earth work is expected to be completed to elevation 4,075.

The annual run-off from the 980-square-mile drainage area above the dam has varied from 322,000 to 1,089,000 acre-feet, with daily discharge rates of from 300 to 8,000 second-feet. Normal discharge during eight months of each year is about 500 second-feet. When completed in the winter of 1947-1948, the dam will provide storage of 500,000 acre-feet of water which will be used as a supplemental supply for the 324,000-acre Boise Irrigation Project.

Features of Design

Preliminary investigations of the dam site indicated that the material in the abutments was not of a suitable nature to support a concrete dam. In addition to that fact, the shortage of suitable concrete aggregates in the vicinity made that type of construction uneconomical and confirmed the decision to build a dam of rolled-earth fill.

When all loose and disintegrated material had been cleaned from the ledge rock, a trench extending 3 to 10 feet into the solid rock was made for the base of each of the two concrete cut-off walls. On the bases, which vary from 3 to 5 feet wide, cut-off walls ranging in height from 5 to 20 feet and having a 9-inch top width and a batter of 1 in 24 on both faces were constructed. These cut-off walls are 150 feet apart in the river channel, but vary in spacing with the topography as they rise along the right and left abutments. Under the cut-off wall footings, stage grouting was done through holes drilled at 10-foot maximum intervals into the underlying rock for depths of 30 to 150 feet. The area between these cut-off walls is being blanket-grouted, with 24-foot holes at about 15-foot centers.

During the construction period, the flow of the river is carried by a diversion tunnel 20 feet inside diameter and lined throughout with 18 to 24 inches of concrete. It has a capacity of 20,000 second-feet which will be reduced to 10,000 second-feet by the penstocks to be installed in connection with the

(*Continued on next page*)

Bureau of Reclamation Photo

Material from the main conveyor belt at Anderson Ranch Dam is loaded by a B-E 120-B electric shovel to 13-cubic-yard end-dump Euclids for placing in the dam.

Here it is..
IMPROVED
HD-10
Over ten per cent increase in ground contact is gained with longer track ... ground pressure reduced. Addition of a truck roller on each track reduces wear and tear. More tractor weight — approximately 860 pounds — assures better all-'round performance.

L·O·N·G·E·R T·R·A·C·K

A better performer than ever with extended track! More track on the ground means greater traction—more grip, more drawbar pull! Cuts scraper loading time, speeds bulldozing and hauling work . . . insures better footing on every type of soil. Operators will like its smoother, easier riding. Owners will welcome increased work capacity.

More good news . . . HD-10's are now more readily available to essential users. In case you have to wait temporariiy . . . it will be well worth while waiting for the *improved* HD-10!

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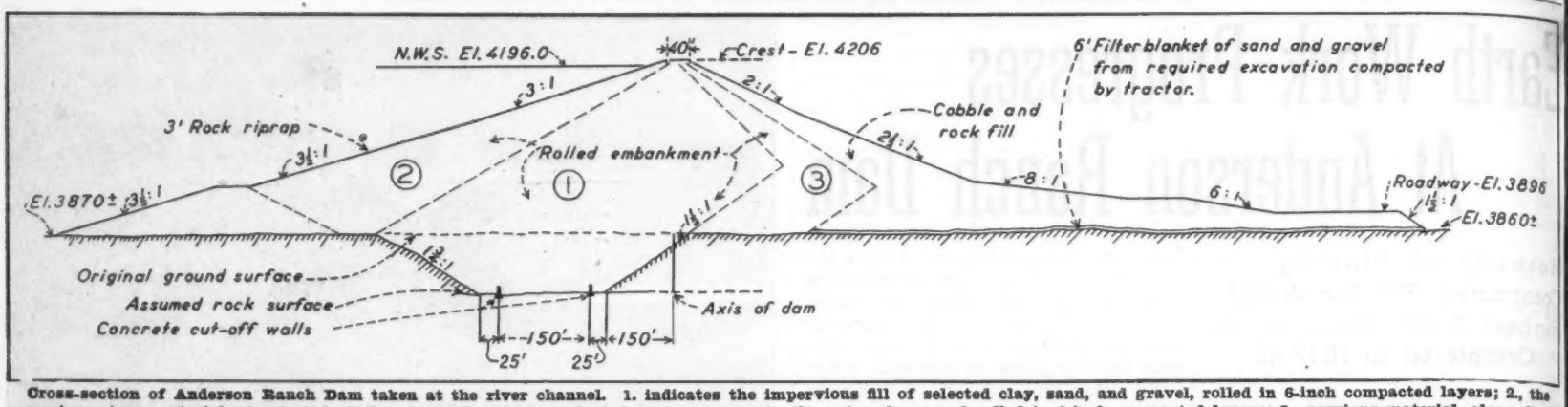

Cross-section of Anderson Ranch Dam taken at the river channel. 1. indicates the impervious fill of selected clay, sand, and gravel, rolled in 6-inch compacted layers; 2., the semi-pervious material of selected clay, sand, and gravel graduated in coarseness to the outer slopes and rolled in 6-inch compacted layers; 3., pervious material, also rolled in 6-inch compacted layers. When completed in 1947-48, this structure, the highest earth dam in the world, will contain 8,650,000 cubic yards of fill.

Earth-Fill Placing At Huge Idaho Dam

(Continued from preceding page)

power house when that is constructed in the future (See C. & E. M., January, 1943, page 2).

The rolled earth-fill dam constituting the principal item of construction under this contract includes three classes of earth, all selected by soil experts of the Bureau of Reclamation and available at locations convenient to the site of the dam. Class 1, forming the central core of the dam, is a very dense material obtained from the Dixie pit and transported by a conveyor system to the dam site. On both the upstream and downstream sides of the core is being placed a semi-pervious class 2 material which will provide stability against sloughing when the fill is saturated. For additional stability, the outer section of the up and downstream portions is constructed of free-draining sand and gravel. The upstream face is protected from wave action with a 3-foot layer of rock riprap and the downstream slope of the embankment is covered with a cobble and rock fill founded on a gravel filter blanket.

Material for both class 2 and class 3 fill is at present being obtained from the Whipple pit approximately 2,000 feet upstream from the center line of the dam. After the 1945 construction is completed, however, this pit will be under water and new pits will be opened at points downstream.

The dam will have a crest width of 40 feet and a length of 1,400 feet. From toe to toe is approximately 2,400 feet up and downstream. The spillway, with a capacity of 20,000 second-feet, will be built in solid rock near the left abutment of the dam. Its crest elevation will be 4,174 feet above sea level and the designed water level of 4,196 feet will be maintained by two 25 x 22-foot radial gates. The spillway will have a width of 53 feet at the gates and 100 feet in the pool, wall heights of 38 feet at the inlet and 59 feet at the pool, and a drop, from water to water at maximum discharge, of 324 feet.

Moving Dirt and Rock

The Dixie pit from which will be obtained all of the material for the impervious fill, approximately 50 per cent of the 8,650,000 cubic yards in the dam, is located 7,000 feet from the south abutment. A Bucyrus-Erie 100-B and a 120-B electric shovel load the pendulum belt which swings about the feeder belt delivering the material to the main conveyor. At times when it is considered uneconomical to move these feeding conveyors, loading is done by four bottom-dump Euclids which drive diagonally over a grizzly of 12-inch I-beams placed to give a 5-inch opening to the conveyor belt. The 2-mile-long conveyor system which transports

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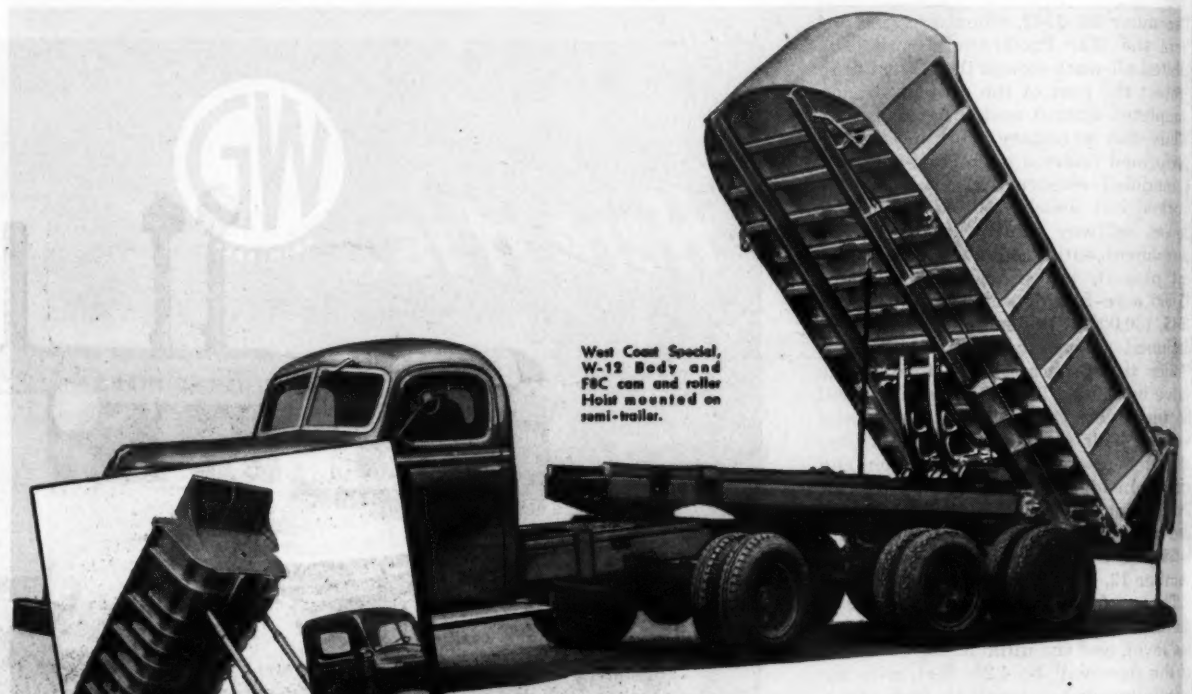
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Earth-Fill Placing At Huge Idaho Dam

(Continued from preceding page)

material from the Dixie pit to the dam site was described in detail in a C. & E. Monthly article in March, 1943, page 22. This belt-conveyor system ends at an elevation of approximately 4,170 feet at a point near the left abutment which will be some 30 feet below the final crest. At present, however, material from the conveyor drops approximately 150 feet vertically to a point where it is picked up by the placing equipment. During the 1945 construction season, material from the Dixie pit reached the dam site over the conveyor system at an approximate rate of 5,000 cubic yards per 9-hour shift.

The Whipple borrow pit, the source of semi-pervious and pervious material, also produces riprap and rock fill which is separated from the excavated material by means of a grizzly and a rotary screen. Six to twelve 10-cubic-yard end-dump Euclids, the number depending on the length of haul, which are loaded by a Bucyrus-Erie 100-B 4½-cubic-yard electric shovel, haul the material to a 12-inch grizzly. The plus-12-inch rock falls to the ground 70 feet below the inlet hopper and is later picked up by a shovel and hauled to the riprap and rock-fill section of the dam. The material passing through the grizzly falls onto a conveyor belt which raises the material to a rotary screening plant to remove the plus-5-inch rock. The earth and the rock fall into separate hoppers from which both end-dump and bottom-dump Euclids haul it to the embankment and the cobble and rock fill.

In the dam construction, the layers of class 1, class 2, and class 3 materials are kept at approximately the same elevation, but placing is not usually done simultaneously.

Earth Work Against Rock

The specifications under which the earth work is performed require that all contact of the impervious material with the foundation between the cut-off walls and for 25 feet both up and downstream from them must be made on stable rock thoroughly cleaned, and the material carefully tamped in place.

This requirement is met by a hand crew which varies in size with the difficulties of cleaning the rock foundation but averages thirty men now that the area to be covered between the cut-off walls has narrowed. These men use hand shovels to remove all loose earth or disintegrated rock and then blow the finer material from surface depressions by compressed air from a 4-inch air line, 4,000 feet in total length, with closely spaced outlets in the working area. They then wash the surface of the rock foundation with water from high-pressure hose and place the backfill by hand. Loads of impervious material are dumped by the Euclids as needed, the dirt is placed against the solid rock by hand shoveling, and then is tamped by Gardner-Denver and Chicago Pneumatic tampers driven by air from the same line used for cleaning the exposed rock. The number of pneumatic tampers varies from six to twelve, depending on the irregularity of the rock surface and the speed of placing the impervious material.

Placing Earth Embankment

Two scoops of a Bucyrus-Erie 120-B electric shovel, working against the 150-foot face of material dropped from the main delivery belt at the dam, loads one of the five 13-cubic-yard bottom-dump Euclids used to haul the material an average distance of 600 feet from the shovel to the point of placing in the dam.

The earth is dumped in windrows parallel to the axis of the dam and insofar as possible the travel of the Euclids is kept parallel to this axis to eliminate the possibility of uncompacted ruts being formed through the dam.

Bureau of Reclamation Photo

All fill placed next to rock and cut-off walls is carefully hand-tamped.

Each Euclid travels alongside a windrow, cuts in at the end of it, and dumps its load at a signal from the spotter. Two bulldozers on Caterpillar D8 tractors then spread the dirt in 8-inch loose layers approximately 10 feet wide which are compacted to 6 inches.

This compaction is obtained by seven sheepsfoot rollers. During spreading

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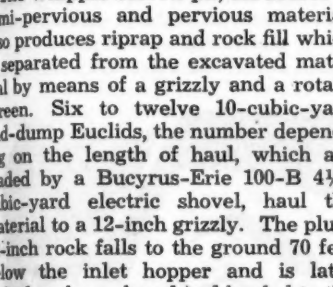

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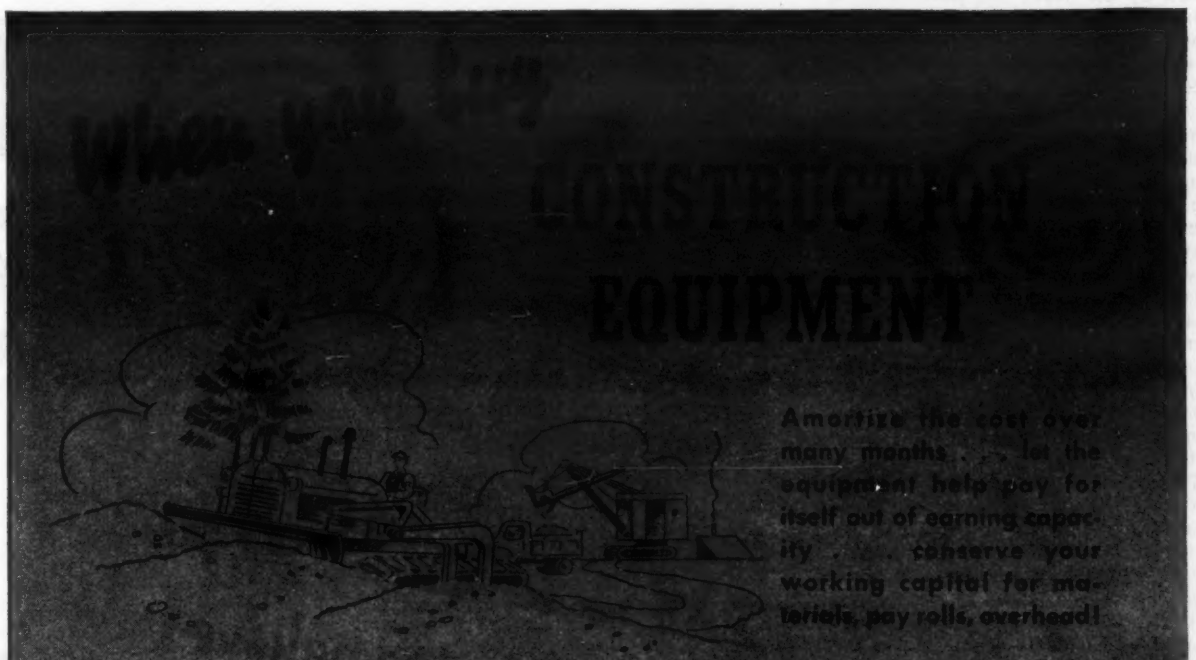
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Earth-Fill Placing At Huge Idaho Dam

(*Continued from preceding page*)

and rolling, water is added to the material when its moisture content is below that desired. Water for this purpose is hauled in one 1,400-gallon and one 2,200-gallon tank mounted on Euclids. They discharge by gravity and are loaded from a 6-inch standpipe erected about 1,000 feet downstream from the dam axis. This standpipe is supplied from the water system installed to serve all construction operations, including concreting and grouting. Pressure is provided by gravity from an inlet constructed upstream. If breakdowns or operational difficulties interfere with continuous earth placing, the tank trucks are kept going during the daylight hours, to prevent excessive drying of the top layer. Further to retard objectionable drying, the top layer, left rough by the heavy sheepsfoot rollers, is bladed smooth by a Caterpillar No. 12 motor grader when the required rolling has been completed.

Since the large areas involved in the lower portions of the dam make it impossible to place more than one 6-inch compacted layer during each shift, running from 6 a.m. to 3 p.m. and from 3 p.m. to midnight, it is difficult to prevent a difference in moisture content between successive layers of the fill. The blading reduces this drying considerably but does not eliminate it completely at the surface because of the hot sun and drying winds. Therefore, each layer which has been bladed smooth to retain the moisture is sprinkled to prevent a bone-dry condition on top and then scarified just ahead of the placing of the next layer.

This scarifying is done by a special job-built harrow pulled by a Caterpillar D8 tractor. It was made of 12-inch H-beams in the form of an equilateral triangle 10 feet on each side. Steel bars 2 x 4 inches in section and 24 inches long, with demountable teeth, four in each side H-beam, one in the nose, and five in the back H-beam, are dropped through slots cut in the beams and adjusted for depth below the frame by bolts through holes on 4-inch centers in the individual teeth. The ⅝-inch-diameter bolts hold the teeth at the required depth by insertion through holes in ¼ x 2-inch straps welded to the top of the H-beam frame on each side of the slots. In use, the teeth are set to scarify the earth fill to a depth of from 3 to 4 inches.

Illumination for the operations of the late shift is provided by 300-watt electric lights spaced at 50-foot intervals on two cables stretched across the canyon from one rocky hilltop to the opposite one, and by several banks of floodlights which are placed at strategic points on each abutment.

Fill Compaction

The material in the Dixie pit from which the impervious portion of the dam is constructed approaches its optimum moisture so closely in its undisturbed state, about 75 per cent of it being at optimum and the remainder ranging from 0.5 per cent wet to 1 per cent dry, that no provisions for either adding or removing moisture were made at the pit.

Arrangements were made to add water if needed at one point in the conveyor system but it was not found necessary to use this device very frequently. The installation of a Sturtevant Silentvane fan at one of the 6-foot-drop transfer points on the conveyor system is being studied to see how effective it would be in reducing the moisture of the material, as all experience and laboratory testing show that placing is more economical and a more stable structure is produced when the material is drier than laboratory optimum. It is also well known that the optimum moisture content for the rollers in use is somewhat lower than laboratory maximum. As an example of that fact, it was reported that during a few days of uninterrupted high-speed progress, material which contained ¾ of 1 per cent less than optimum moisture content produced some field compaction which could not be duplicated in the laboratory even by doubling the energy of the standard compaction being used.

Bureau of Reclamation Photo

During spreading and compaction of the earth fill for Anderson Ranch Dam, water is added by sprinkler trucks to provide proper moisture content.

The 1944 average optimum moistures indicated were as follows:

	Per Cent
For material of which less than 31 per cent passed a 200-mesh sieve	12.2
For material of which between 31 and 44 per cent passed a 200-mesh sieve	13.4
For material of which more than 44 per cent passed a 200-mesh sieve	14.1

During 1944, the average field-placing moisture was 0.6 per cent below laboratory optimum. Screen analysis indicated that 70 per cent of the material had from 31 to 44 per cent passing the 200-mesh sieve. At this field moisture, the field densities were 1.3 pounds higher than laboratory optimum. It

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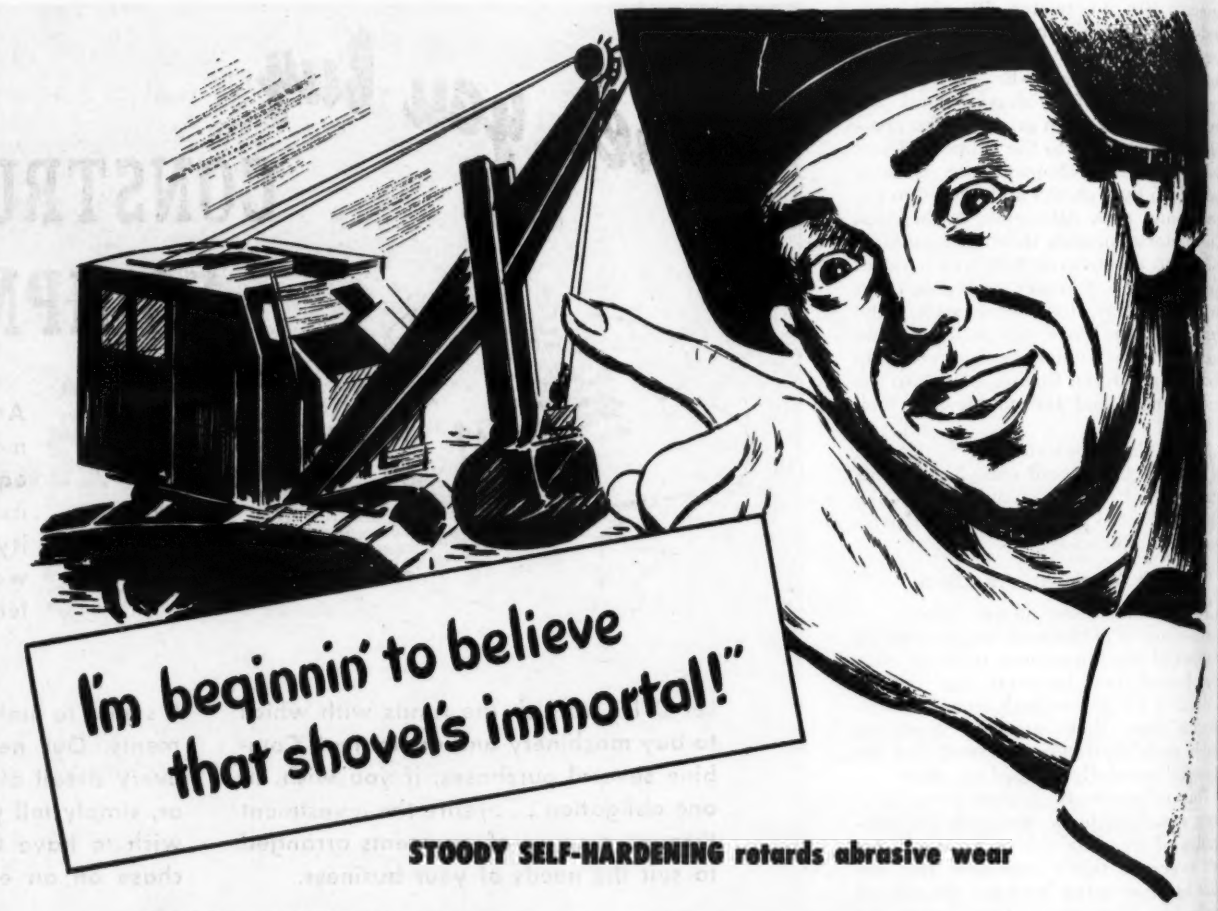

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You'll find that a handy supply of Stoody Self-Hardening is your most powerful weapon against destructive wear. You can use it not only on bucket parts, but with equal efficiency on rollers, idlers, tumblers, track pads . . . in fact, wherever earth abrasion eats away the life of your heavy equipment.

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Earth-Fill Placing At Huge Idaho Dam

(Continued from preceding page)

has been found by the Bureau of Reclamation earth laboratories in Denver that, on this type of material, minimum pore pressures due to consolidation will be produced when the material is placed dry of optimum and that for certain depths of fill the limiting moisture may be as low as 2 per cent dry. In practically all of the dam, density tests indicate that field compaction has been 98 per cent of laboratory standard.

The sheepsfoot rollers used to obtain this excellent compaction are of standard Bureau of Reclamation design. Seven double-drum rollers are used, and twelve passes over each layer ordinarily provide acceptable compaction. With the long feet used on the rollers, they do not "walk out" of the 6-inch layer on which they travel but make the final compaction on the lift below, and field tests for compaction are always made on the lower layer.

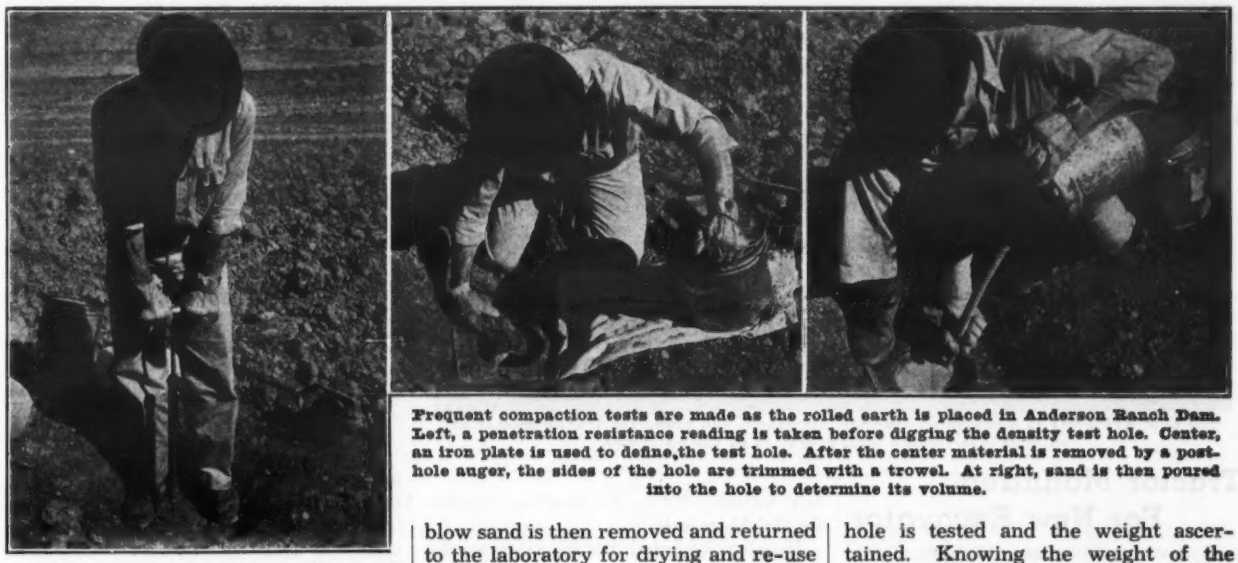
The rollers have an empty weight, for a two-drum unit, of 23,320 pounds and are ballasted to a working weight of 40,390 pounds. The drums are 5 feet in diameter and 5 feet long with 14 inches between the ends of the two drums. Each drum carries 120 feet, 10 inches long, with 3-inch-diameter circular knobs, and gives a unit pressure of 481 pounds per square inch. Six of the double-drum rollers are pulled by Caterpillar D8 tractors while the seventh one is pulled by two Seventy-Fives.

Checking Field Compaction

A crew of two men in the field and three in the laboratory make compaction tests as the construction progresses, attempting to make a test for each 1,500 cubic yards of compacted fill. In making this standard test, the field crew first remove the "fluff" to the depth of maximum penetration of the roller feet on an area about 18 inches square. They then place a 12-inch-square steel plate on the surface of the compacted layer at the bottom of the hole and tamp it to a firm level bearing by hitting a 1 x 2-inch engineer's stake laid flat on the plate and spanning the 7-inch-diameter hole in the center.

Earth from inside this hole is removed by first digging out that in the center with a 5-inch post-hole auger to a depth of 6 to 8 inches, and then shaving the sides of the hole with a garden trowel. All the material taken from the hole is placed in a 25-pound lard can, to be weighed and tested in the laboratory.

Thoroughly dried blow sand is poured into the hole from a long-spouted gasoline can until it is level full. By weighing that remaining in the container, and subtracting that weight from the previously ascertained weight of the full container, the poundage required to fill the hole is determined and the volume of the hole is computed. Most of the blow sand is then removed and returned to the laboratory for drying and re-use in later tests.



Frequent compaction tests are made as the rolled earth is placed in Anderson Ranch Dam. Left, a penetration resistance reading is taken before digging the density test hole. Center, an iron plate is used to define the test hole. After the center material is removed by a post-hole auger, the sides of the hole are trimmed with a trowel. At right, sand is then poured into the hole to determine its volume.

In the laboratory, the moisture content of the material removed from the hole is tested and the weight ascertained. Knowing the weight of the earth which is removed from a hole of known volume, it is a simple matter to

(Concluded on next page, Col. 3)

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Tractor Mounting For New Excavator

A new combination dragline, clamshell and crane for tractor mounting, which permits a working combination of a bulldozer with the other units, has been announced by the Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore., and 1800 No. Adams St., Peoria 1, Ill. This Hystaway unit can be installed in two hours on the rear of a tractor, and does not interfere with bulldozer operation. Full tractor mobility is retained, as the crawler-track oscillation is not impeded by the unit; tractor rigidity, when desired, can be accomplished by a crank control at the mast head.

Easily transported by dump or flat-bed trucks, the Hystaway can be taken from one job to another for tractor installation. On one occasion a unit was carried by plane from Yuma, Ariz., to Richmond, Va. Field-tested in actual use on many road and construction jobs, the Hystaway is claimed to have solved many construction and maintenance problems.

Complete information regarding this combination unit may be secured direct from the manufacturer.

Big Road-Construction Plans in State of Mexico

A gigantic road-building program is planned for the State of Mexico in which the national capital, Mexico City, is located, according to Alfred del Mazo who became governor of that state in September. Plans for the road program, which is designed to encourage tourist trade and also to improve transportation of farm produce to market, were revealed by Governor-elect del Mazo when he visited the plants of the Goodyear Tire & Rubber Co. in Akron, Ohio, recently. This was part of an extended tour of the United States before taking office, to study industrial and agricultural conditions.

The road-building program planned will cost about 20,000,000 pesos, or close to $5,000,000. In addition to the tourist attractions in this part of Mexico, this area is also attracting many new industries and soon will be the most important industrially in the Mexican republic, del Mazo said.

He also predicted that his state would be a big market for tires for earth-moving and road-building equipment, trucks, and farm machinery.

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Earth-Fill Placing At Huge Idaho Dam

(*Continued from preceding page*)

compute the density of the material before its removal from the hole and thus check the efficacy of the field compaction methods in use.

Major Quantities

The major bid items for the construction at Anderson Ranch Dam include the following:

Earth fill	7,500,000 cu. yds.
Sand and gravel filter blanket under rock fill in downstream slope	110,000 cu. yds.
Cobble and rock fill	1,900,000 cu. yds.
Riprap	90,000 cu. yds.

Personnel

Anderson Ranch Dam in Idaho is being completed for the Bureau of Reclamation by the same contractor who was low bidder when the pre-war contract was awarded, the Morrison-Shea-Twaits-Winston Co., composed of Morrison-Knudsen Co., Inc., of Boise, Idaho; J. F. Shea Co., Inc., Los Angeles, Calif.; Ford J. Twaits Co., Los Angeles, Calif.; and Winston Bros. Co., Minneapolis, Minn. V. A. Roberts is Project Manager, with William Woodall as Superintendent, Bill Denton as "Walking Boss", and R. H. Madsen, Engineer. For the U. S. Bureau of Reclamation, Construction Engineer H. F. Bahmeier is in charge with D. S. Walter as Principal Assistant. U. V. Engstrom is Field Engineer and Edwin Henry is Chief Earth-Work Inspector.

District Representative Is Appointed by Galion

Robert C. Monnett, formerly Maintenance Engineer and later Division Engineer of Division 3, Ohio Department of Highways, has been named by the Galion Iron Works & Mfg. Co., Galion, Ohio, as district representative for Wisconsin, Minnesota, Iowa, South Dakota, North Dakota, and the upper peninsula of Michigan. Mr. Monnett can be reached through local Galion distributors.

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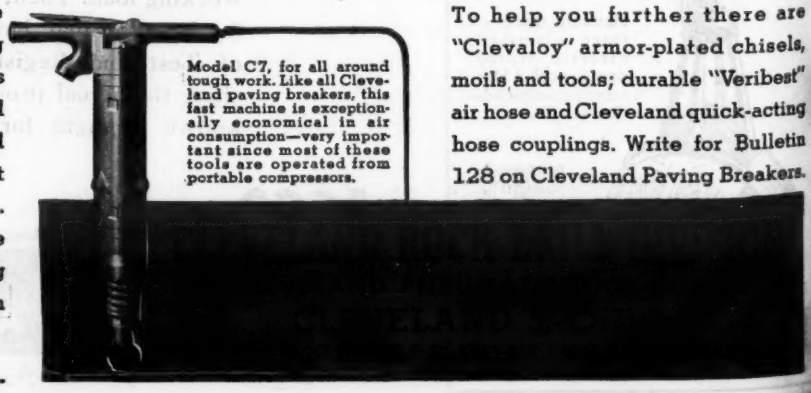
Furthermore, the complete Cleveland line offers the *right* model for *every* job! Make your choice from: (1) The 80 lb. C7, best for average work; two run from a No. 85 compressor. (2) The 82 lb. C9, a slugger for the hardest work; two run from a No. 85 compressor. (3) The 35 lb. C10, a smaller tool for lighter work; three run from a No. 85 compressor. (4) The 58 lb. C11, with long stroke and heavy, slugging blow. Two run from a No. 85 compressor.



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22-Mile Road Job

(*Continued from page 1*)

portant highway between Birmingham and New Orleans, and the number of war plants in the vicinity which it serves. Also depending on this road are such important institutions as the Northington General Hospital for Veterans, the Brice Hospital, an insane asylum, and a school for feeble-minded children.

The existing road is of 18-foot plain concrete, 9-6-9-inch section, built in 1927-1928, and failed badly in 1940, requiring much bituminous patching since then to keep its cracked and broken surface in a passable condition. State maintenance forces have resurfaced 28 miles of this 33-mile road with plant-mix bituminous material so that traffic can use it until the new road is opened. (See page 103).

Wide Approach Contract

At the western end of the improvement, the concrete pavement laid in 1928 and varying in width from 18 to 24 feet was removed for a distance of 1¾ miles in preparation for the grading and laying of a new 64-foot pavement. The contract for this work, amounting to $330,609.26, was awarded to the R. H. Wright Contracting Co. of Columbus, Ga.

The old road was broken up by pavement breakers, excavated by a Lorain 1-yard shovel, and loaded into trucks which hauled it away for use as riprap around the culverts. The roadway is being widened on the north side through an area overgrown with light timber which was removed and saved for pulpwood. On this contract no additional material for earth work had to be taken from borrow pits since cut and fill quantities balanced.

Earth that had to be moved distances of 500 to 3,500 feet was transported in five 16-yard bottom-dump Euclids which were loaded by the Lorain shovel. For the shorter hauls, which averaged from 300 to 400 feet, two LeTourneau 12-yard scrapers pulled by Caterpillar D8 tractors were used.

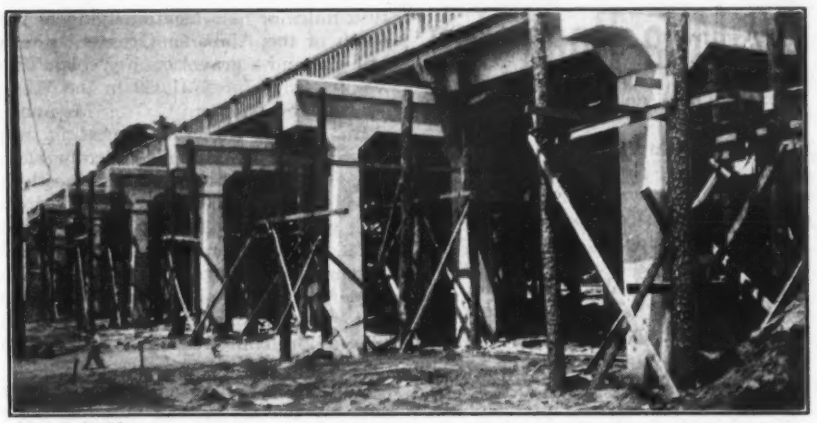
The new pavement has a clear width of 64 feet between 6-inch integral curbs, with 10-foot shoulders. On the south side a 5-foot sidewalk of 5-inch concrete is included in the shoulder. The concrete slab has a uniform thickness of 8 inches, reinforced with welded wire-fabric mesh of No. 2 gage weighing 51.4 pounds per 100 square feet. An 8-inch parabolic crown was called for in the slab which is divided into four 11-foot lanes, and two 10½-foot lanes on which the curb is built. Two 22-foot strips were paved first, followed by the 10½-foot section on either side. In addition to the mesh reinforcing, adjacent slabs are connected by tie bars placed beneath the mesh which is 3 inches below the surface. The tie bars between the two center lanes are ⅝-inch round, 2 feet 9 inches long and spaced 1 foot 3 inches on centers; between the next two lanes the bars are ½-inch round, 2½ feet long, also spaced 1 foot 3 inches on centers; and the same-size bars are used on the two outer lanes on each side but here the spacing is 2½ feet on centers.

Pat Langston was Project Engineer for the Alabama Highway Department and M. Phillips was Superintendent for the Wright Contracting Co. on this 1¾-mile contract which included the following major items:

Excavation	54,900 cu. yds.
8-inch pavement	68,800 sq. yds.
Reinforcing steel	218,391 lbs.
Concrete pipe 15 to 36-inch	7,400 lin. ft.

Bridge Contract

Adjoining this contract to the east is a 1¾-mile stretch of 40-foot pavement which was improved three years ago by widening the existing 18-foot concrete pavement with a gravel base, and then laying a black-top plant-mix surface over the entire width. No further work is being done on the roadway in this section. However, at one point where the road is carried over the single track Gulf, Mobile & Ohio railroad on a reinforced-concrete overpass with a roadway width of only 22 feet, this structure was widened to 44 feet by the Montgomery Construction Co. of Montgomery, Ala., at a cost of $62,969. The bridge is 342½ feet long, consisting of nine 32½-foot reinforced-concrete deck-girder spans, and one 50-foot span, directly over the track, carried on five steel girders, 2 to 3 feet deep, spaced at 5½ feet on centers.



C. & E. M. Photo

To widen an overpass on U. S. 11 in west-central Alabama from 22 to 44 feet, a column was added on each side. Here is the south side of the structure, showing the new columns and the falsework for the superstructure.

Two columns were added, one at each side, at a distance of 12 feet on centers

(*Continued on next page*)

C. H. & E. CONSTRUCTION EQUIPMENT

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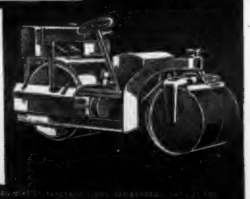

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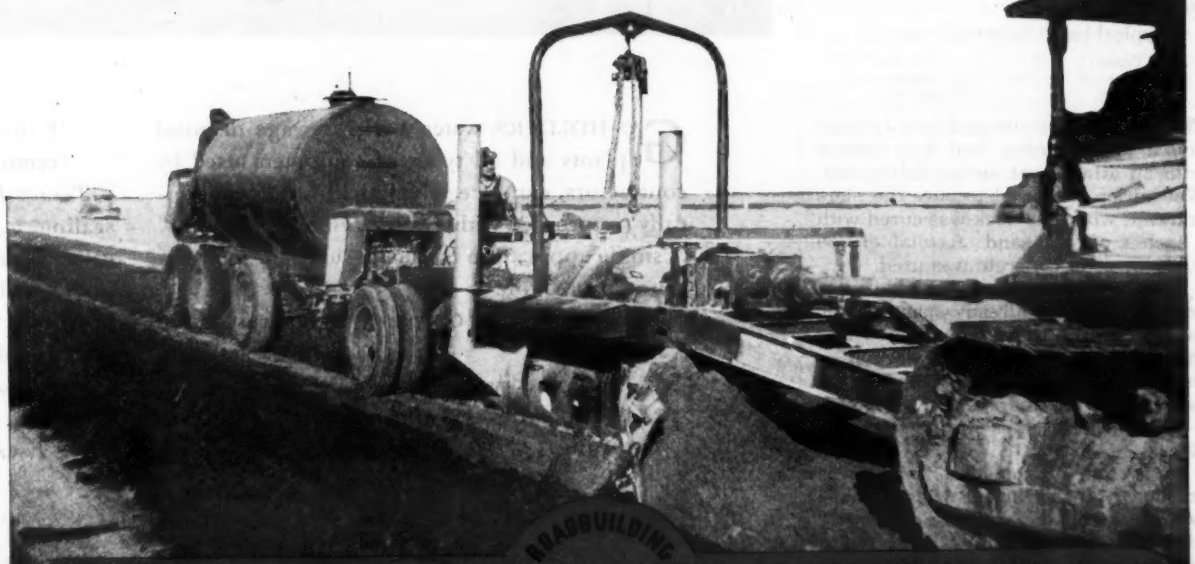
Those are brief facts why Wood Roadmixers are paying off for contractors everywhere—why a Wood Roadmixer will give you higher production at less cost and more profit than any similar equipment on the market.

For complete specifications and costs see your nearest Wood Roadmixer distributor or write direct.



ROADBUILDING EQUIPMENT

WOOD MANUFACTURING CO.

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22-Mile Road Job

(*Continued from preceding page*)

from the existing 2-column bents. Excavation for the footings of these 2-foot square columns was done by a Lorain crane with a 40-foot boom and a ½-yard clamshell bucket. After the 7 x 7 x 3½-foot-deep concrete footings were poured on a hard clay foundation, the same crane was used to lift a concrete bucket in pouring the piers which averaged about 20 feet in height. The 3-foot square caps were then carried out over the new columns and the handrail and curb on the bridge were removed by a Thor and a Worthington pavement breaker operated by a Schramm air compressor so that the 11-foot width could be added to each side.

Falsework was then erected to hold the forms for the superstructure. Each 32½-foot span had two timber bents on each side, 12 feet on centers and 10 feet from the new concrete columns. Each bent had two 10-inch-diameter posts on either side which were capped with 10 x 10's. To make sure the falsework had a firm bearing, concrete pedestals, 3 x 3 x 1½ feet deep, were poured under about two-thirds of the posts. Mud sills, consisting of two 8 x 10-inch x 8-foot railroad ties extending under two posts, were placed under the rest. Across the caps went 6 x 12-inch stringers, eight to the span, with an additional 4 x 12 stringer on each side for the sidewalk form support. Heavy 1⅝-inch tongue-and-groove stock was used for the beam and deck forms. The forms were cut with two electric Skilsaws and a 10-inch-diameter-blade rip saw run by a Delta motor which was set up on the bridge deck.

For pouring the caps, girders, and slab a Koehring Dandie 2-bag mixer was set up on the deck, with a Jaeger 2-bag mixer as a spare. Coosa portland cement from the National Cement Co. at Ragland, Ala., was transported 100 miles to Tuscaloosa over the Alabama Great Southern railroad and brought the remaining 5 miles to the job in a truck. Water for the concrete was tapped directly from a main of nearby Alberta City, no pump being required. Sand and gravel were supplied and stockpiled at the site alongside the mixer by the Yazoo Sand & Gravel Co. of Tuscaloosa after a 5-mile haul from its plant. The batches were weighed in wheelbarrows on a Winslow Junior scale on their way to the mixer, where they were mixed for 1½ minutes before being trundled to the forms in Insley 9-cubic-foot buggies with rubber-tired wheels.

A typical batch by weight was:

Cement	188 lbs.
Sand	394 lbs.
Gravel	606 lbs.

The concrete was vibrated by a Jackson and a Mall vibrator and was rubbed with an attachment on the latter unit. Wet burlap was used to cure the piers and caps while the deck was cured with 2 inches of wet sand. A total of 780 cubic yards of concrete was used.

Two steel girders on each side were added to the five already spanning the railroad track. They were also 50 feet in length, and of the same section as those already in place. To support the deck forms on this span, five 15-inch I-beams were used as stringers on each side.

An average of from 18 to 20 men was employed on this bridge widening between the start of work on February 12 and its completion in July. M. I. Smith was Superintendent for the Montgomery Construction Co., and J. L. Blair was Project Engineer for the Alabama Highway Department.

New Location

The next contract to the east covers 10½ miles of new location lying to the north of the Alabama Great Southern railroad and a gravel county road. This was awarded for $731,959 to the Weymouth Construction Co. of Memphis, Tenn., which sublet the grading and culverts to J. E. Milam of Birmingham, Ala. The soil in this region is mostly a red clay, but 130,000 yards of sandstone rock was encountered. This was drilled with jackhammers and a Cleveland wagon drill followed by blasting with 40 per cent dynamite. Power for these tools was supplied by a Worthington 305, a Sullivan 160, and a Chicago Pneumatic 105-cfm compressor.

Clearing of the right-of-way was done by two Caterpillar tractors, a D8 and a D7, with bulldozers, which later in the grading operations pulled a 16-yard and an 11-yard LeTourneau scraper, respectively. Other equipment included an additional Caterpillar D8 with a 16-yard LeTourneau scraper, and an Allis-Chalmers tractor pulling an 8-yard Heil scraper. One Caterpillar D7 acted as a pusher in loading while two other Caterpillar D7's pulled a Bros and a LaPlant-Choate sheepsfoot roller. Over a 10-hour day this equipment moved around 2,000 to 2,500 cubic yards with an average haul of 700 feet, each unit making about 10 trips per hour at a speed of 5 mph. Finishing the grade was done by two power graders, a Caterpillar No. 12 and a No. 10.

Earth-work operations were started the last week of April and were finished late in September, with the addition of four 16-yard Tournapulls to the early equipment. Other units on the job included a Speeder crane for excavating roadbed topping material from borrow pits for filling in wet spots in the new road, and a LeTourneau rooter for breaking up hard areas in the cuts.

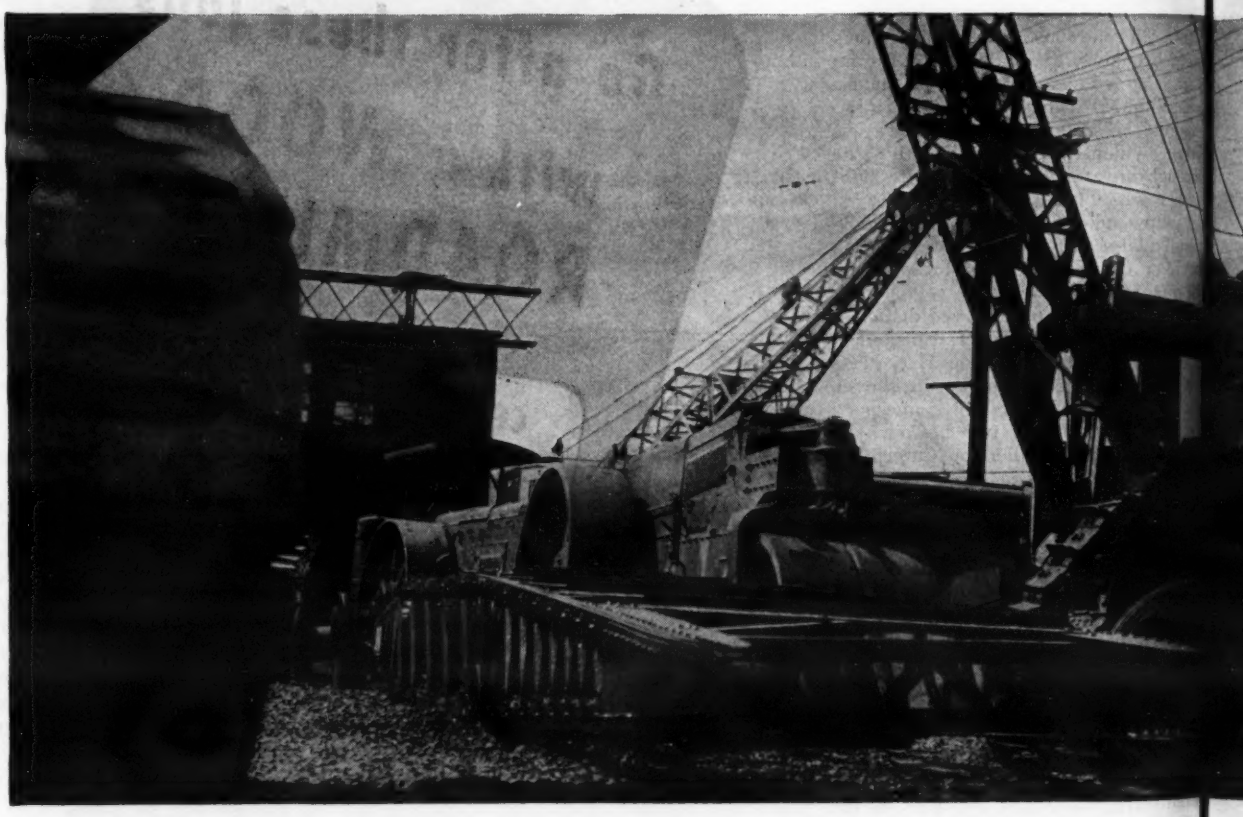
To test the compaction of the soil moved into the new roadbed, the Alabama Highway Department set up a small field laboratory housed in a 12 x 12-foot wooden shed mounted on wooden skids so that it could be pulled to any part of the job by a tractor. The soil was sufficiently moist so that practically no water had to be added in the fills, but aeration was necessary at times to dry out some of the material. This was done by blading the earth with the graders and tractor-dozers.

Concrete Slab

The concrete pavement for this 10½-mile contract and for the same length of contract adjoining it to the east is a 9-7-9-inch section 24 feet wide, with 8-foot shoulders. The slab has a 1½-inch parabolic crown and is reinforced with the same type of mesh as that used on the Wright contract, and also has ⅝-inch round deformed tie bars, 2 feet 9 inches long, spaced 3 feet 4 inches on centers down the center of the road 3½ inches below the top of the pavement. Pouring was done for the full width, with a 2½ x ⅜-inch longitudinal joint down the center. The transverse contraction joints are the same size while the transverse expansion joints are 1 inch thick for the full depth of the slab. The expansion joints have

(*Continued on next page, Col. 4*)

In Storage...In Use... AN



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U. S. Army Signal Corps Photo
Land goes to sea, as Caterpillar tractors with bulldozers build sand causeways from the beaches on Okinawa to landing ships.

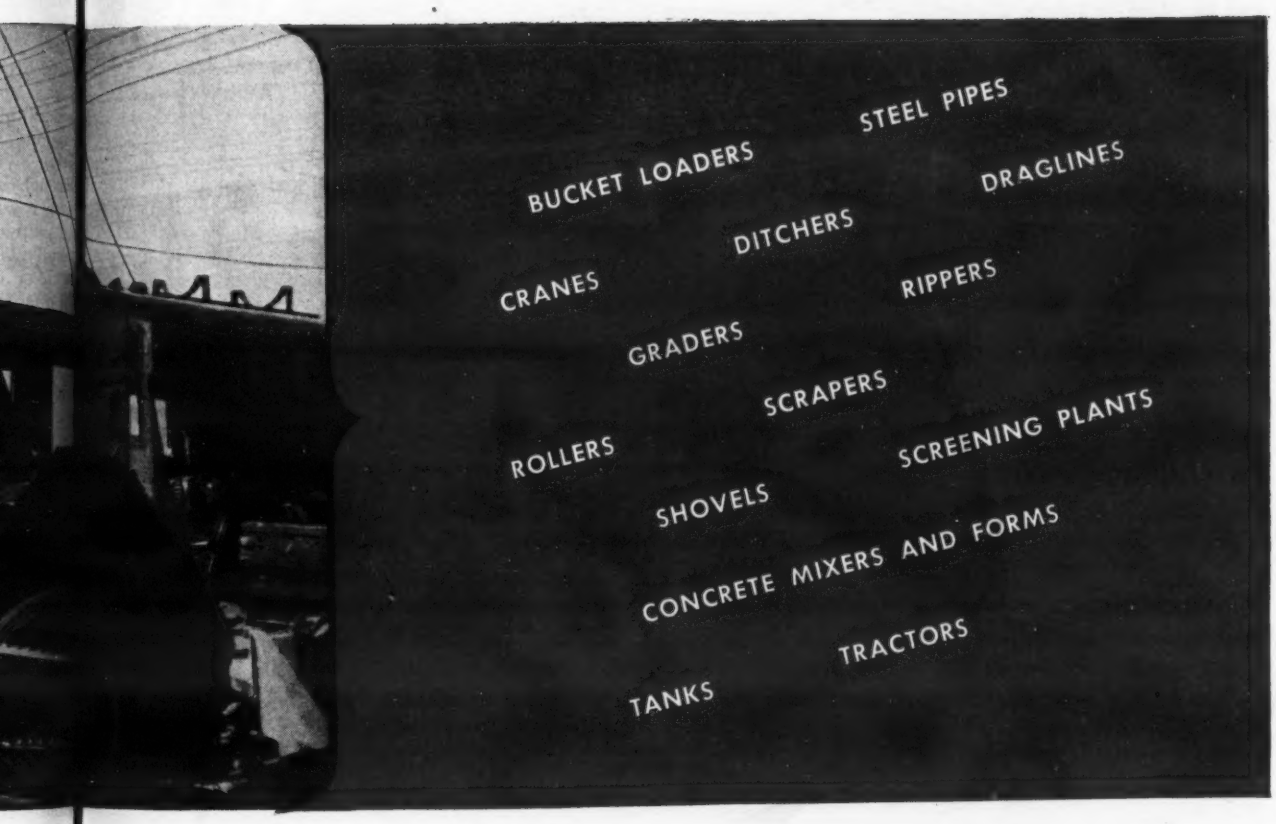
Diagnosis of Trucks By New Dynamometer

Although plans for speedy reconversion to peacetime production offer the hope of new motor trucks in the not-too-far-distant future, state and county highway departments and contractors still have to get a good many miles out of their present equipment. In addition, it will be essential that every truck fleet in the construction and highway field have a thorough analysis, to determine which vehicles should be discarded and which have more years of service, when the time comes for replacements.

A piece of garage equipment designed to provide such a truck analysis is made by the Clayton Mfg. Co., Alhambra, Calif. This Model 61 Moto-Mirror dynamometer measures the power output under any desired combination of engine speeds and loads, and any type of road condition, all of which can be simulated in the garage or shop. Because the vehicle may be checked under these varied conditions, frequently ignition troubles which do not show up under one speed are readily detected under another, and can be corrected immediately. It is stated that it takes only a few moments to secure an accurate picture of the ignition system, timing, carburetor, fuel system, air cleaner, exhaust, governors, valves, rings, engine and chassis foreign noises. A glance at the floor after the tests reveals any oil, gasoline, or water leaks. Another check with the Moto-Mirror after repairs and adjustments are made insures that the unit is running smoothly and satisfactorily before it is taken out on the road.

A new catalog on the Model 61 Moto-Mirror dynamometer is now on the press. Copies may be secured soon by addressing your requests to the manufacturer and mentioning this news item.

A Need Rust Protection



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Rustproof Compound

22-Mile Road Job

(Continued from preceding page)

¾-inch round dowels, 15 inches long, supported on metal chairs, running through them at 15-inch spacing.

On the Weymouth contract, the transverse joints were set at various spacings to see which gives the best results. Over one-third of the job the expansion joints were placed 60 feet on centers with one contraction joint at the midpoint between. On another one-third, the expansion joints were set every 120 feet with two equally spaced intermediate contraction joints. The remaining distance has expansion joints likewise at 120 feet but has five intermediate contraction joints at equal spacing. On the adjoining contract of 10½ miles to the east the expansion joints are spaced every 80 feet with one intermediate contraction joint at the center point.

The estimated major quantities on the Weymouth Construction Co. contract were as follows:

Clearing and grubbing	146.5 acres
Excavation	493,000 cu. yds.
Roadbed topping material	45,700 cu. yds.
Tile underdrain, 6 and 8-inch	17,000 lin. ft.
Concrete pipe, 15 to 36-inch	5,200 lin. ft.
Concrete pavement, 9-7-9-inch	135,000 sq. yds.
Reinforcing steel, pavement and bridges	215,979 lbs.

For the Alabama Highway Department W. G. Little was Project Engineer, and S. C. Dent was Superintendent for the contractor.

Ziegler Contract

The eastern 10.6 miles of the new highway was awarded to the Ziegler Construction Co. of Nashville, Tenn., on its low bid of $707,552.58. In its grading operations, tractors and scrapers were used for hauls 500 feet or less. Included in the fleet of dirt-moving equipment were a Caterpillar D8 tractor with dozer for clearing; three other Caterpillar D8's pulling a Gar Wood 18-yard scraper and LeTourneau 14 and 20-yard scrapers, with an International TD-18 tractor serving as a pusher in loading; and a Caterpillar D7 pulling a LeTourneau 6-yard scraper. For hauls from 500 to 700 feet, a Caterpillar DW-10 rubber-tired tractor pulling a La-Plant-Choate 10-yard scraper was used. The fill was compacted by a sheepsfoot roller pulled by a Caterpillar D6 tractor, with the grading being done by a Caterpillar D7 with a LeTourneau bulldozer, and a Caterpillar No. 12 power grader. With this equipment an average of 3,500 cubic yards of earth was moved in a 10-hour day but, with the later addition of two more scrapers and rubber-tired tractors for the longer hauls, this total reached 4,000 yards.

Plastic soil in the roadbed was replaced with an 8-inch compacted layer of selected gravel or sand-clay from borrow pits along the right-of-way, which was loaded by a Northwest 1-yard dragline and hauled in a fleet of ten 3-yard trucks to the required locations.

The estimated major quantities on the Ziegler Construction Co. contract were as follows:

Clearing and grubbing	165 acres
Excavation	448,000 cu. yds.
Roadbed topping material	56,500 cu. yds.
Tile underdrain, 6 and 8-inch	17,500 lin. ft.
Concrete pipe, 18 to 36-inch	5,400 lin. ft.
Concrete pavement, 9-7-9-inch	152,400 sq. yds.
Reinforcing steel, pavement and bridges	252,367 lbs.

For the Alabama Highway Department, J. Y. Kilpatrick was Project Engineer, and C. H. Gregory was Superintendent for the contractor.

Drainage Structures

The larger drainage structures on the entire highway were constructed by H. H. Donahoo, a Birmingham, Ala., contractor, for $72,816. This contract included six concrete culverts ranging in size from a double 10 x 7-foot to a triple 15 x 12-foot structure, and one reinforced-concrete deck-girder bridge 134 feet long, of the 2-column-bent

(Concluded on next page, col. 3)

An Expressway Study For Hartford, Conn.

Another careful study for post-war highway construction has recently been released by the Bureau of Highway Planning Studies of the Connecticut State Highway Department. The first study, covering the Waterbury area, was reviewed in some detail on page 6 of the January, 1945, issue of CONTRACTORS AND ENGINEERS MONTHLY. The present study covers the Hartford Metropolitan Area, and the consummation of the entire project would require an expenditure of $22,000,000.

The plan includes, as its first major project, a new expressway from downtown Hartford to the West Hartford center and eventually to Farmington, to be constructed in three sections of 2.8, 1.7, and 4.8 miles. The estimated cost is $18,100,000, of which $9,800,000 would be for right-of-way. The second project is a new expressway from Main Street in New Britain east through Newington to the recently improved Berlin Turnpike which enters Hartford from the southwest. This 4.2-mile project will cost $3,600,000, of which right-of-way will cost $1,100,000.

The summary of the study states:

1. The modern highway improvements which are in use, together with those which are scheduled for completion in the immediate post-war period, will provide a modern integrated express highway system into Hartford from three directions, north, east, and south.

2. Routes entering Hartford from the west and southwest, all two-lane surface streets, carry some of the heaviest traffic loads which enter the city.

3. Traffic from West Hartford, the greatest individual source of traffic to Hartford, should be served directly by an expressway.

4. Traffic from Route 4 and present U. S. 6 should ultimately be served by a continuation of the Hartford-West Hartford expressway southwesterly from West Hartford center to Corbin Corner.

5. Traffic from Hartford to New Britain should be served by an expressway easterly from New Britain to U. S. 5 in Newington.

6. Distribution facilities in both Hartford and New Britain must extend into the central area of each city in order to serve effectively the great bulk of traffic which is destined to these central areas.

7. Expressways and distribution facilities should be adequate, or provide flexibility in the design, to accommodate a 100 per cent increase over the estimated 1940 traffic flows.

8. The development of adequate parking terminals and the development of expressway highways leading into cities are each a part of the same traffic-congestion problem and are inseparable. Either improvement without the other cannot provide a wholly satisfactory solution to this critical urban traffic problem.

9. Priority section 1 in Hartford, the improvement from Bulkeley Bridge and the Hudson Street traffic circle westerly to Sisson Avenue, and priority section 2, the improvement from Main Street in New Britain easterly to U. S. 5 in Newington, are the most urgently needed improvements in the area.

10. The development of the proposed expressways, which is essential if traffic is to move and not to stall, will provide far-reaching benefits. The motorists will travel in and through Connecticut cities with a freedom and degree of safety heretofore impossible. Great community and business benefits will result from improved traffic conditions.

The Hartford Plan was evolved by the Connecticut State Highway Department, William J. Cox, Commissioner, with the cooperation of the Mayors of Hartford and New Britain, Robert J. Ross, City Engineer of Hartford and his staff, and the Hartford Flood Control and Improvement Commission.

22-Mile Road Job

(*Continued from preceding page*)

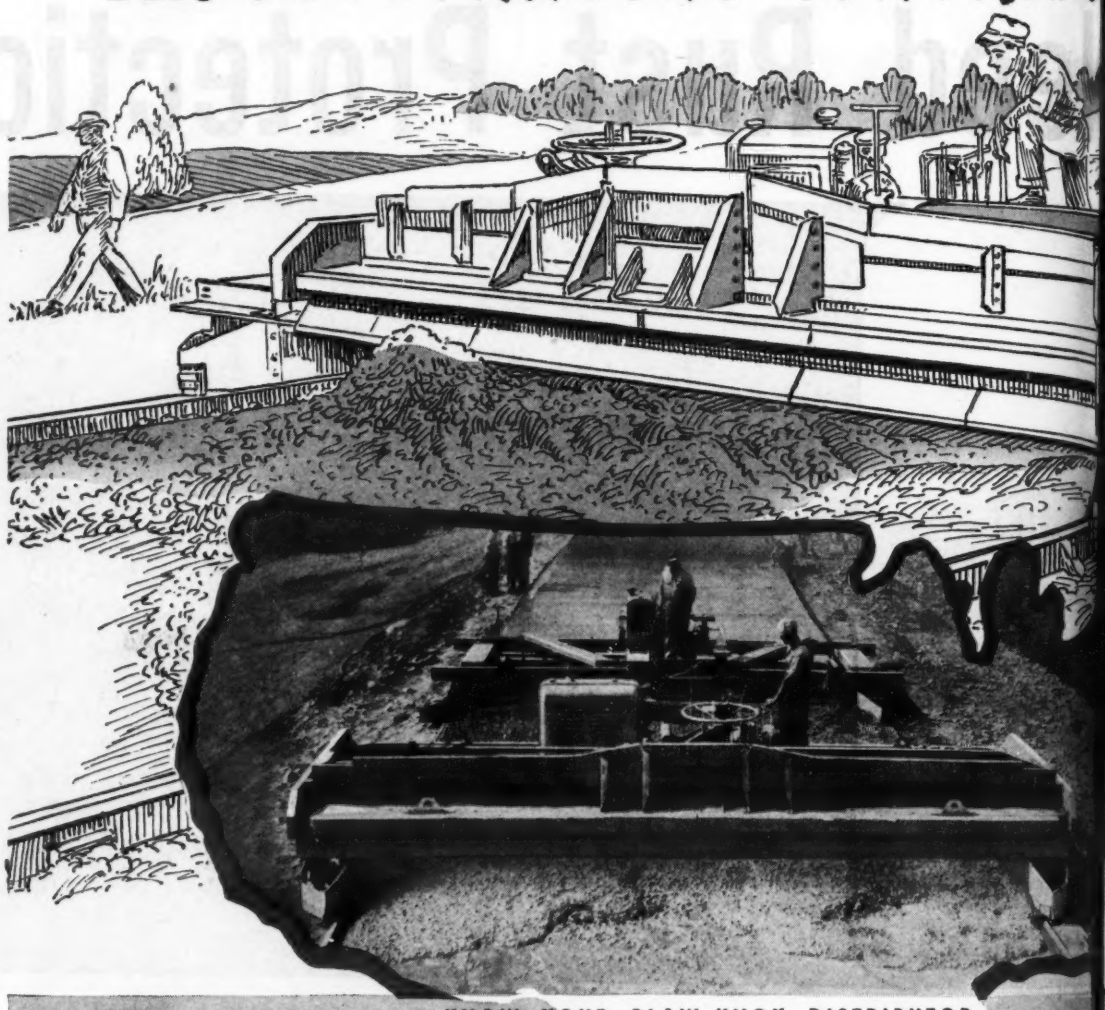
type, with four 26-foot spans and one 30-foot span. Four girders, 1 foot 4¾ inches wide x 2½ feet deep, support a 7-inch slab 28 feet wide. A total of 737 cubic yards of concrete went into these structures. A. C. Coon was Superintendent for the contractor and E. T. deGraffenreid was Project Engineer.

Many small structures, consisting of residences, barns, filling stations, and other small buildings, were encountered along the new highway, and two contracts were let for their removal. On the western half of the road, nineteen such structures were removed by the Grant Construction Co. of Montgomery, Ala., with Fred McDougal, Superintendent, for $2,865; on the eastern half twenty-two structures were removed by E. H. McCoy of Jasper, Ala., for $8,825.

Personnel

G. W. Phillips is Construction and Maintenance Engineer for the Alabama State Highway Department, with J. F. Tribble as Assistant Construction Engineer. J. W. Chambers is State Bridge Engineer. This work is located in the Third Division of which S. J. Cumming is Division Engineer. H. G. Beaird is Resident Engineer in charge of all contracts on the entire 22-mile project.

The OUTSTANDING CONTRIBU



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Industrial Dynamite Once More Available

Dynamite for industrial uses, a necessary key to heavy industry's reconversion to peacetime production and full employment, is now available for all demands, according to a recent announcement by F. S. Pollock, General Manager of the Explosives Department of the Atlas Powder Co., Wilmington 99, Del.

Mr. Pollock pointed out that tremendous construction and building projects will have a great effect on our national well-being during the next few years. The coal, ore, limestone, cement, building stone, and aggregates necessary for a great construction program cannot be produced without explosives' "controlled force". There is no reconversion problem to be met by the makers of industrial explosives, and manufacturing facilities are adequate to meet any foreseeable requirements. "Dynamite stands ready at the push of the switch to help industrial America back onto its peacetime feet," Mr. Pollock's statement concluded.

Coated Lens Improves Surveying Instruments

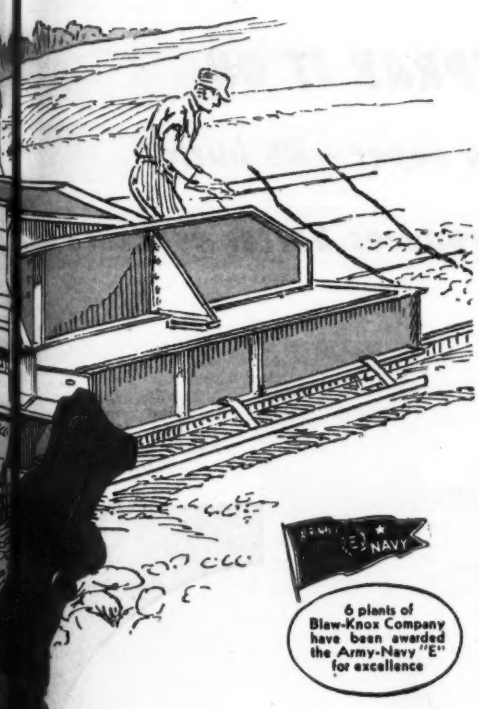
A new development in the manufacture of surveying instruments is described in a 4-page catalog on the use of coated-lens systems, available from the David White Co., 305 W. Court St., Milwaukee 12, Wis. Light transmission, it is stated, is greatly increased in the coated lens, resulting in a brighter and sharper image with greater contrast due to reduction of the haze caused by internal reflections. The principles upon which the new lens are based and the results obtained are described in text and charts, and the last page of the catalog reprints a table which provides a quick means of determining the gains in light transmission in a lens system.

Copies of this informative catalog will be sent upon written request to the David White Co., and mention of this publication.

Nelson Joins LeTourneau

Robert F. Nelson has been added to the executive staff of R. G. LeTourneau, Inc., Peoria, Ill., as Vice President and Assistant to the President. The new appointment is designed to enable R. G. LeTourneau, President of the company, to devote more time to research and engineering activities. Mr. Nelson, former Vice President and Director of the Arma Corp., Brooklyn, N. Y., will work closely with Denn M. Burgess, Executive Vice President, and Merle R. Yontz, Vice President and Treasurer. One of his first assignments will be to assist in establishing a new LeTourneau plant in England this autumn.

to Paving Equipment in 25 Years



6 plants of Blaw-Knox Company have been awarded the Army-Navy "E" for excellence

The Blaw-Knox CONCRETE SPREADER
Automatic Transverse Blade Type
FAST-EFFICIENT-ECONOMICAL

Here is the complete mechanical solution to the problem of spreading dry, harsh concrete mixes in large volumes at high speed. The Blaw-Knox Concrete Paving Spreader, first used on the Pennsylvania Turnpike in 1940, has proved itself indispensable to contractors for high production, low-cost paving work all over this country as well as abroad. It spreads concrete uniformly and accurately. With the pavement vibrator added, this one-man operated machine spreads and consolidates the concrete in a manner to satisfy the most exacting specifications.

300 Linear Feet of 22 Foot Width Slab per Hour

And that's not exceptional performance for the Blaw-Knox Concrete Paving Spreader — it's normal. On airport or highway paving construction this machine will handle the maximum output of two dual drum 34-E Paving Mixers. A Blaw-Knox Finishing Machine is the perfect team-mate for the Blaw-Knox Concrete Paving Spreader.

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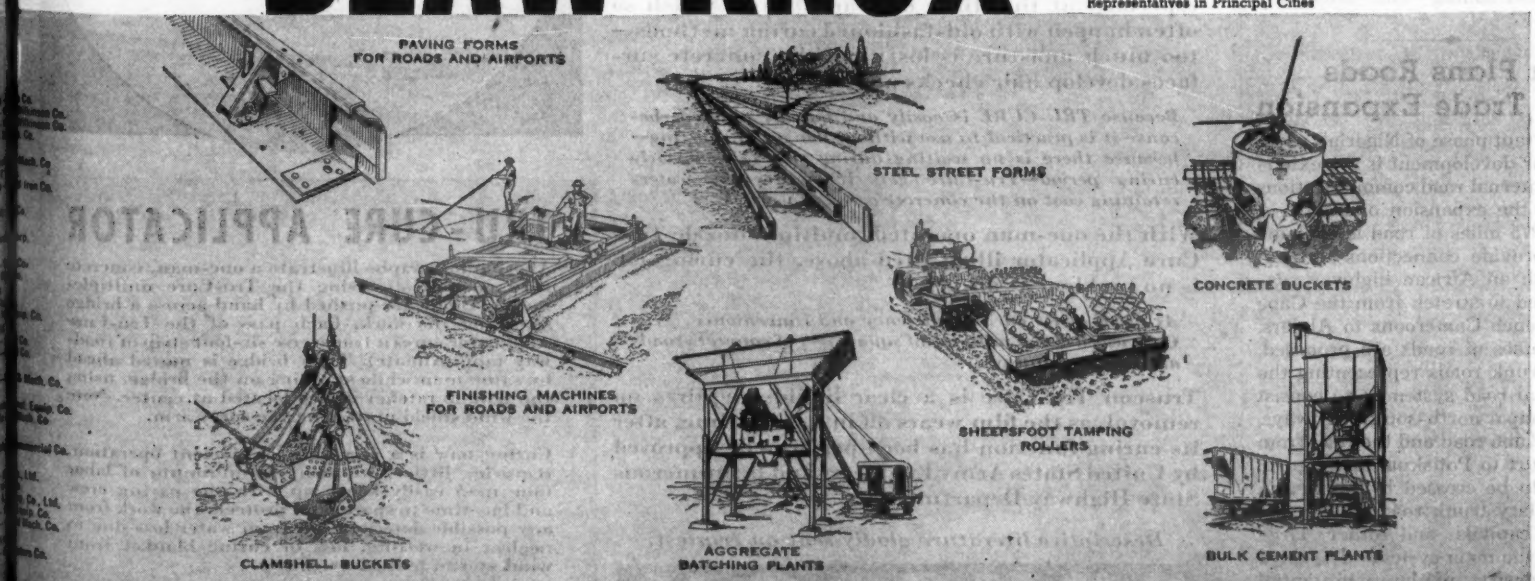
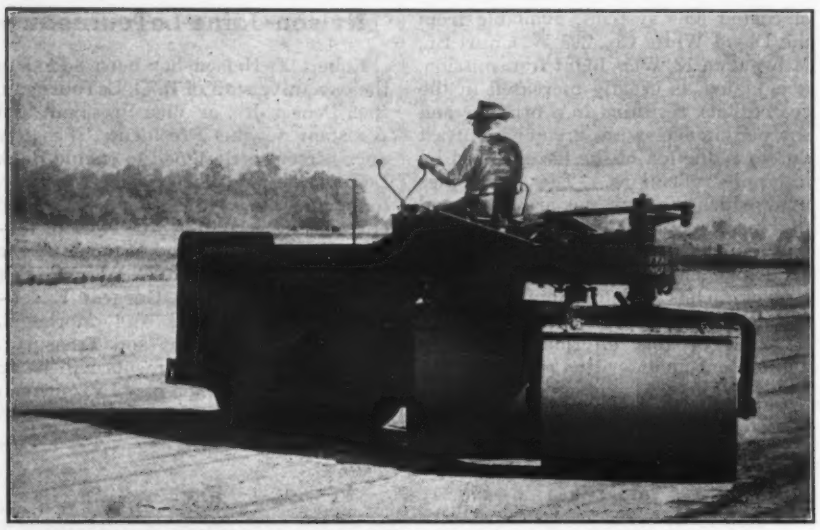


A COMPLETE LINE OF CONSTRUCTION EQUIPMENT FOR CONCRETE PAVING OF ROADS, STREETS AND AIRPORTS, AND FOR GENERAL CONCRETE CONSTRUCTION.



A Buffalo-Springfield 3-axle tandem roller can make a turn in a 22½-foot radius.

Three-Axle Tandems For Rolling Runways

During the war more information was brought to light on the use of 3-axle rollers and their effectiveness in compacting bituminous pavements on highways and runways. In laying over 100,000 tons of asphaltic concrete at Mather Field, Calif., a Barber-Greene Tamping-Leveling Finisher, furnishing some initial compaction, placed all the hot-mix, followed immediately by a Buffalo-Springfield fully ballasted KX-24 3-axle tandem giving a maximum compression of 436 pounds per linear inch. The contractor, A. Teichert & Son, Inc., of Sacramento, Calif., used no 3-wheel roller for breakdown as the fully-ballasted tandem had sufficient power to handle all compaction.

The accompanying illustration shows an unusual performance by a Buffalo-Springfield 3-axle roller. Working at the new airport at Springfield, Ohio, the 3-axle tandem is making a turn on a 22½-foot radius measured to the outside of the track.

The Buffalo-Springfield Roller Co., Springfield, Ohio, designed and developed the 3-axle tandem roller not only to produce higher compaction in all types of bituminous pavements, but also to reduce surface roughness. Because of their very construction, 3-axle tandem rollers cannot follow the contours of the pavement. The three rolls are in the same plane and automatically concentrate weight on high spots in the surface. The guide and drive rolls are of larger diameter and both guide rolls are steerable.

Full information and specifications covering Models KX-16 and KX-24 will be found in a bulletin which may be secured direct from Buffalo-Springfield by mentioning this illustrated news item.

Nigeria Plans Roads For Trade Expansion

An important phase of Nigeria's plans for post-war development is the extension of its internal road communications to promote the expansion of trade. A total of 48,275 miles of road is contemplated to provide connections through Nigeria with an African highway system expected to stretch from the Cape through French Cameroons to Algiers.

Three classes of roads are proposed. A grid of trunk roads representing the main arterial road system is to consist of two principal north-south highways, the Lagos-Kano road and the road from Port Harcourt to Potiskum and Nguru. These are to be crossed by four east-west secondary trunk roads to connect provincial capitals and other large towns with the main system. The third category consists of less substantial feeder roads to provide necessary local communications.

The trunk road system of Nigeria has already been partly developed, and lacks but 455 miles of its final total of 4,175 miles. In addition to this new road, more than 1,000 miles of the existing main road will be improved.

In the case of the main system, the total mileage required is estimated at 4,100. This will involve opening up an additional 718 miles and the improvement of 820 miles of existing roads. Bituminous surfacing of at least 240 miles is contemplated.

According to the estimates of the Public Works Department, the lesser feeder roads will eventually cover 40,000 miles of varying length and quality, according to the need. About 24,000 miles are in existence, 17,000 miles require improvement, and 16,000 miles need to be newly constructed.

This extensive project, which is expected to be completed by the colony's Public Works Department by 1958-59, will cost approximately £7,000,000, according to a recent report in *Foreign Commerce Weekly*. Part of this will be met from Nigeria's own resources and partly by assistance provided by the Colonial Development and Welfare Act. Grants totaling £1,810,000 under this Act have already been approved for the purpose. As is customary, the feeder roads will be primarily the responsibility of the native administrations.

More "E" Awards

The War Department has authorized the Chain Belt Co. of Milwaukee, Wis., to add a fourth star to its Army-Navy "E" pennant originally awarded to the company in September, 1942. This firm's war work included the manufacture of tank turrets, gun shields, ammunition hoists, "water buffalo" tank treads, and a variety of howitzers and cannons including anti-aircraft guns and the 155-mm Long Tom field gun, in addition to its production of construction equipment and power-transmission machinery.

The Koehring Co., of Milwaukee, wound up almost four years of production for war with a fourth award of the Army-Navy "E". Approximately 2,000 Koehring 205, 304, 605, and 606 excavators and Dumptors were manufactured for the armed forces.

TRUSCON TRU-CURE for CURING CONCRETE

SPRAY IT ON

No paper — No burlap

Produces better concrete

One-Man operated Tru-Cure Multiple-Nozzle Applicator. (Patented)

Remove "BOTTLE NECK"

FROM

CONCRETE PAVING JOB

After the concrete has been finished—there is still the curing job. And curing has to be done right, especially at this time of year. Delays, which so often happen with old-fashioned curing methods—too much moisture is lost; and the concrete surfaces develop hair checks and crazing.

Because TRU-CURE is easily and quickly applied—because it is practical to use without danger of marring—because there is no waiting during this critical early curing period—Tru-Cure gets its protective, water-retaining coat on the concrete early.

With the one-man operated, multiple-nozzle Tru-Cure Applicator illustrated above, the curing job is no problem at all.

As proof of its curing efficiency and convenience, Tru-Cure was used on millions of square feet of concrete roads and airport runways.

Truscon Tru-Cure is a clear liquid—requires no removal, as the film wears off in a short time, after its curing function has been performed. Approved by United States Army Engineers and by numerous State Highway Departments.

Descriptive literature gladly sent on request.

TRUSCON LABORATORIES Inc. DETROIT MICHIGAN

TRU-CURE APPLICATOR

Above photographs illustrate a one-man, concrete road curing job, using the Tru-Cure multiple-nozzle Applicator pushed by hand across a bridge spanning the work. Each pass of the Tru-Cure Applicator cures a transverse six-foot strip of roadway (approximate). Then bridge is moved ahead by same man while standing on the bridge, using the handle ratchet device located at center. Note the wind shield protecting the spray arm.

Curing now is a very simple, efficient operation, requiring little equipment—a minimum of labor (one man easily keeps up with the paving crew and has time to spare) and protects the work from any possible deterioration from water loss due to neglect in wetting, loss of curing blanket from wind storm, and other causes.

Tru-Cure Applicator machines are available through equipment machinery manufacturers. Photographs and parts list may be obtained by communicating with any Truscon Laboratories' office.

Extreme Measures For Controlling Ice

Methods Used on Alaska Highway When Preventive Measures Failed Can Be Applied in U. S. Ice Belt

THE Alaska Highway traverses territory not closely approached in winter-temperature conditions by any large portions of our northern states, but there are times when in one winter one section or another in this country may be hit. For that reason, we are recording some of the information collected by the Public Roads Administration on controlled maintenance on our famed northern highway which may be used in addition to regular preventive maintenance.

The monthly mean temperature during winter along the Alaska Highway, in degrees Fahrenheit, is about 10 degrees in November, 2 degrees below zero in December, 6 degrees below zero in January, and then it rises to about zero in February, about 16 degrees in March, and about 33 degrees in April. Between October and April freezing temperatures are practically continuous.

Extra Maintenance Measures

While all reasonable ice-preventive measures may have been taken in the location, design, construction, and summer maintenance of a highway, it may still happen that, as the winter progresses, ice may threaten to invade the road surface. Some method of direct control must then be applied. The primary purpose is to keep ice from forming on the road surface where it would interfere with the normal use of the highway. Three general methods were followed in control of icing on the Alaska Highway during the winter of 1943-44:

1. Heating the flowing water by artificial means to prevent its freezing. This was done in locations near the highway.
2. Periodic removal of the ice formed, usually by mechanical means, but sometimes by melting the ice, using artificial heat.
3. Carrying the flow in channels in the ice. These channels required periodic maintenance, the amount depending upon the degree of protection given them.

Under certain conditions icing may be induced at some point uphill from the roadway by exposure that causes some or all of the water flow to freeze at that point and correspondingly reduces the icing at the roadway. Icing is usually induced by stripping or compacting the vegetation and snow cover so that the insulation normally provided is largely destroyed.

On induced-icing areas some control maintenance is necessary. Snow must be removed or compacted from time to time and dikes raised or new ones constructed. Maintenance of the induced-icing areas is to cause ice to form away from the road rather than to prevent its formation.

The methods used on the Alaska Highway during the winter of 1943-44 were selected largely by superintendents and maintenance men. Various ideas were developed and an opportunity afforded to study and compare them.

Freezing Prevented by Heating

Warming the flow of water can effectively prevent the formation of ice at the roadway. All heating methods are expensive, as equipment must be obtained and its use requires frequent attention as well as considerable fuel. With the heating equipment originally available on the Alaska Highway, it was found difficult to concentrate the heat where it was needed, and most of it was dissipated into the atmosphere. To concentrate the heat in the water where it would be most effective, the Army maintenance organization designed and built an oil burner. Oil is fed from a tank on top of the heater through a small tube passing through a larger draft tube nearly to the bottom of the oil drum where combustion takes place.

Since icing inside of culverts was one of the chief difficulties, methods intended to prevent freezing there were devised. Wood and oil fires were kept burning in open-end oil drums standing in the water at the inlet end of culverts. While most of the heat developed by these fires was lost to the atmosphere, some of it did warm the flow of water, usually enough to prevent icing in the culvert. Heaters were also placed at the outlet ends to prevent icing there

(Continued on next page)

Public Roads Administration Photo

This Army-devised oil-burning torch was used inside culverts on the Alaska Highway to prevent freezing.

...pacing the Progress of Power

BUDA engines of the past were more than adequate for the jobs they had to perform. But time and power requirements move on. BUDA'S 64 years of manufacturing experience and 35 years of engine designing skill all add up to modern requirements. By keeping abreast of industrial needs BUDA has truly paced the progress of power — and will continue to build dependable and economical engines for the peacetime jobs ahead.

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Extreme Measures For Controlling Ice

(*Continued from preceding page*)

and consequent blocking of the culverts. To give greater heating efficiency, small houses were frequently built around the stoves at the culvert ends. The oil stoves burned from 10 to 20 gallons of fuel oil per day under extreme conditions. In some cases small oil-burning flares were placed inside the culverts. The heat thus generated was more efficiently used, particularly when the ends of the pipe were almost entirely covered to prevent loss of heat to the outside atmosphere. This type of heater consumed only 3 to 4 gallons of fuel oil per day.

In many places the heating devices were spaced at intervals along trenches cut in the ice. The heat developed at each unit was sufficient to keep the water flowing to the next fire and so on until it passed through the drainage structure and beyond the roadway. Thus a number of heating units might be set up both upstream and down from the roadway to control one icing. In period of extreme cold, fires were required at intervals of about 50 feet along any open trench where it was desired to maintain the water flow.

Under the most adverse temperature conditions, icing will occur in spite of heating methods. At an icing location the points where water emerges may shift frequently and with each change the entire heating set-up must be moved. This is a troublesome and expensive task and frequent checks of each heating set-up are required.

Advantages of this method of icing control are: the necessary equipment is simple and may be readily made or repaired with the facilities available at the nearest maintenance headquarters; skilled operators are not required; and control of icing does not depend upon the continued operation of any one unit of equipment. The disadvantages are: the method is expensive, both in fuel and labor; it is inefficient; and in periods of extreme low temperature does not prevent icing.

Removing Ice Mechanically

At some places the ice was removed periodically with tractors and rippers, blade graders, and motor patrols; by blasting; and by thawing with large oil-burning torches or wood fires. Where these methods were used, no attempt was made to control the formation of ice. It was merely removed whenever the ice began to encroach upon the road surface. No advantage was taken of the natural laws governing ice formation.

Tractor-rippers, blade graders, and motor patrols were used regularly to remove ice on only two sections. On a 2-mile section with rock hillsides between Fort St. John and Fort Nelson blasting was also done to break up the ice along the inside road ditch. On both sections the roadway was constructed as a cut and fill on a fairly steep hillside and with a relatively narrow ditch on the inside. Ice formed on the backslopes and in the roadside ditches from seepage and spring water. As the winter advanced, the flow of water gradually fanned out from the original source by contour spreading along the backslopes so that eventually ice formed on the backslopes and in the ditches for considerable distances along the highway.

Whenever formation of ice on the roadway impended, the ice was broken out along the ditch line by a tractor-drawn one-tooth ripper and bladed across the roadway and over the shoulder by a tractor-drawn grader or motor patrol. It was necessary to repeat this operation every day or two during the colder part of the winter. Even then, removal did not quite keep up with the ice formation but a travelable surface was maintained. Actually the highway surface was gradually built up and widened with broken ice fragments cemented together with ice films. This material was not slippery, however, and caused no difficulty as long as it remained frozen. It seems quite possible that such an accumulation of ice might create a hazardous condition at the time of the spring thaw, but no particular difficulty was reported on either of the sections where the method was used.

While this system is less efficient and more costly than other methods, there are occasions when it must be employed. If icing occurs continuously on a section quite close to a maintenance depot and is rather slow in forming so that it can be easily controlled by its occasional removal, and if there is other work in the area to require the maintenance of heavy equipment, then such procedure may be justified.

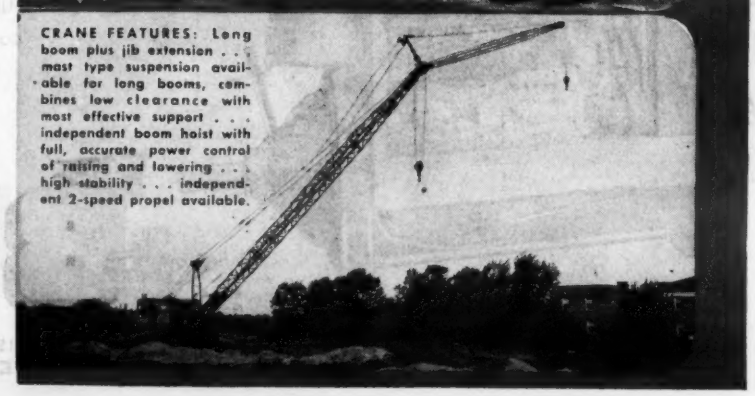
There is little to recommend the method for general use. A large crawler tractor is the only machine with enough power and traction to pull or push the equipment necessary to break up the ice. Such a unit is expensive to operate, particularly under extreme weather conditions. If the ice formations are spread out over a considerable length of highway, much time will be lost in traveling from one to another, or several complete outfits must be maintained. Unless the tractor is placed in a heated garage at night or operated 24 hours a day, it may be difficult to start it and considerable time may be lost. Ice forms in many places inaccessible to heavy equipment. In culverts and inlet and outlet ditches it must be removed by other means, so that other equipment must be available.

Blasting Has Disadvantages

Blasting was resorted to in certain areas to loosen ice in roadside ditches. Ice broken by blasting is not entirely removed from its original position, and hand or machine work may be necessary to supplement the blasting. As the ditches again fill with ice, the blasting operation must be repeated. In some places the ice broken by blasting was not removed from the ditch and later was covered with snow plowed from the roadway surface. This appears to be good practice as the small amount of seepage water readily percolated between the broken fragments of ice and was prevented from freezing by the

(*Continued on next page*)

DRAGLINE FEATURES: Big working ranges . . . full rotating fairlead . . . big treads for ample bearing area (convertible from flat to tapered ends in field) . . . fully responsive control . . . oversize brakes.



CRANE FEATURES: Long boom plus jib extension . . . mast type suspension available for long booms, combines low clearance with most effective support . . . independent boom hoist with full, accurate power control of raising and lowering . . . high stability . . . independent 2-speed propel available.

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Public Roads Administration Photo
A truck-mounted steam generator proved most effective in opening frozen drainage channels along the Alaska Highway.

Extreme Measures For Controlling Ice

(Continued from preceding page)

insulating covering of snow.

The blasting method is probably not as expensive as the tractor-ripper, blade-grader, and motor-patrol method and may be used in places inaccessible to heavy equipment. It should not be used to open culverts or in the vicinity of telephone lines, camps, or other facilities. After a few unfortunate experiences with broken telephone lines, blasting as a method of ice control was largely discontinued along the Alaska Highway. Blasting is sometimes effective in starting induced icing or in opening subsurface channels for the passage of seepage water.

Steam Generators for Channels

Occasionally results similar to those achieved with the tractor-ripper and blasting methods were obtained by actual thawing of the ice. This method is expensive and has little to recommend it. Heat is supplied either by oil-burning torches or by wood fires. The flame thrown by torches was usually confined under half sections of oil drums or culvert pipe for more efficient heat direction against the ice to be thawed. While the large oil-burning torch or "flame thrower," as it was called, thaws the ice quite rapidly, it requires about 6 gallons of oil per hour. It cannot safely be used in wooden drainage structures and its general use for thawing ice is not recommended.

Carrying water in either protected or open channels made with portable steam generators such as were available along the highway during the latter part of the winter was found to be a useful method. Other methods were also used to construct open channels in the ice. A steam jet is well adapted to cutting a confined channel so that a minimum of water surface will be exposed to the atmosphere. Flow in the channels may be facilitated by supplemental heating, as previously described, or the channels may be reopened at intervals as the icing development necessitates.

This method, combined with channel protection, appears to offer the greatest possibility of control of icing, after it actually begins, of any method observed along the highway. Full advantage may be taken of the insulating properties of ice, snow, and air. The ice must first be allowed to form to a depth of 2 feet or more to provide a medium through which drainage channels may be cut. This ice will insulate the flow, and will support further insulation such as paper, boards, brush, or snow falling directly on the covering or thrown off the road surface by maintenance forces. If conditions are such that the required depth of ice cannot be permitted to form without danger of icing on the road surface, then much more frequent attention will be required. Grade raises, icing basins, and deep and narrow drainage trenches permit the formation of ice to such a depth that effective channels may be opened through or under the ice by a steam jet.

If a steam jet is used for cutting passageways under the ice, it is best to start operations at the culvert or drainage-structure outlet. As a channel is formed under the ice in the drainage structure, the water from the condensed steam and melted ice will enlarge the opening already formed and will also, in most cases, find an outlet for itself under the vegetation and snow downstream. It is good practice to leave this downstream cover undisturbed, and allow the outflow of water to form its own subsurface drainageway.

After an opening has been made under the ice in the drainage structure, a channel can be formed under the ice from the culvert inlet to the apparent source of the flow. This can be done by pushing the steam jet down through the ice at intervals of about 3 feet. It may take some probing with the jet to locate the source of the water, but when this is done a considerable volume of water is likely to be released and further icing activity stopped for some time. At a number of places the method was so successful as to give a complete cure for the trouble for the remainder of the winter.

Trenches jetted with steam are defi-

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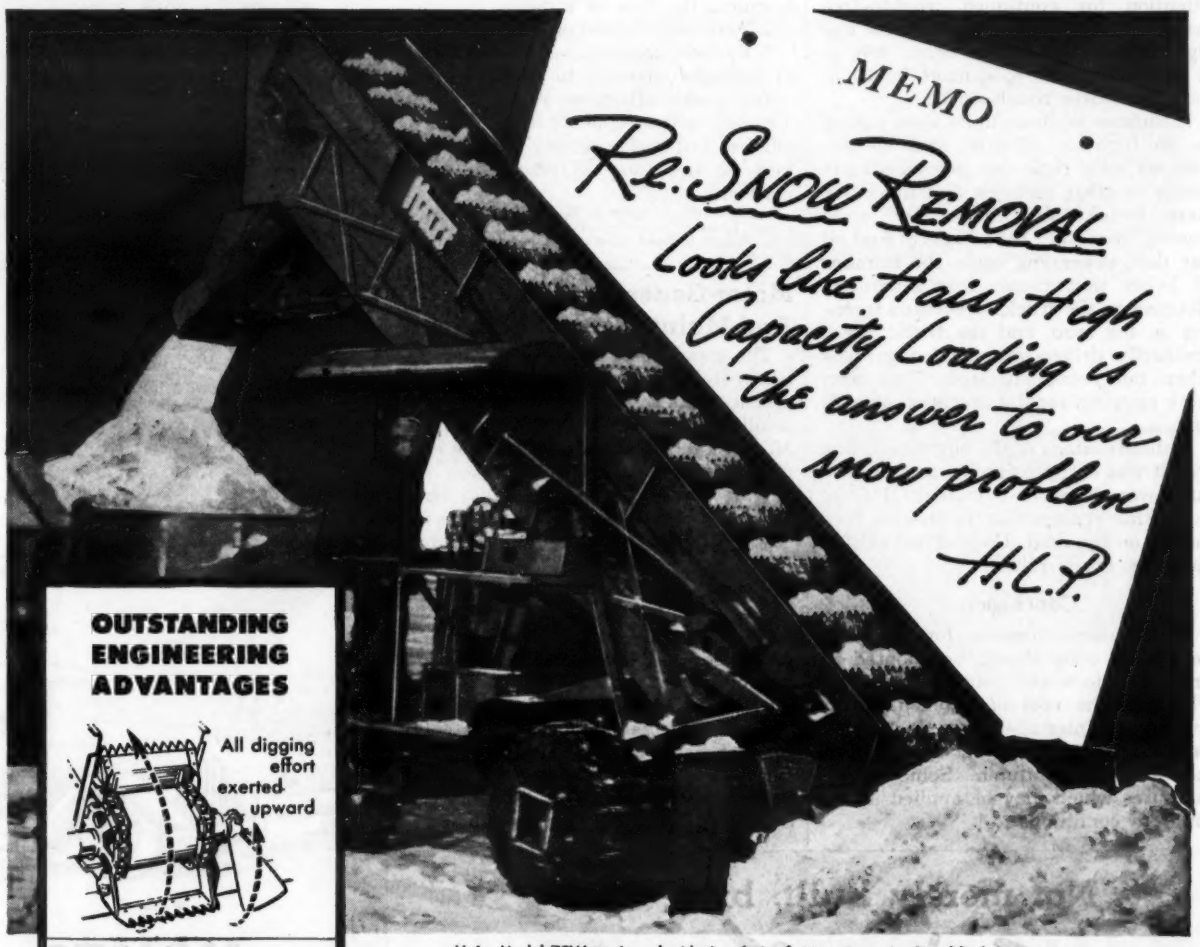
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OUTSTANDING ENGINEERING ADVANTAGES
All digging effort exerted upward
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Haiss Model 75W equipped with tire chains for traction grip. Simplified design also provides for interchange of wheels and creepers. Standard parts; no shop work.

You're looking at what happens to a pile of wet, dry or frozen snow when a Haiss Model 75W digs in . . . breaks it up and loads better than 10-yards a minute. Into every part of this one-man-operated Loader goes all of the sound engineering and manufacturing experience that account for the longer service life and lower operating costs of all Haiss-built equipment. Interchangeable bucket elevator available to convert machine for handling concrete aggregates. Catalogs containing complete information will be sent promptly on request.

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Extreme Measures For Controlling Ice

(*Continued from preceding page*)

nitely better than those made by other methods. Blasting forms wide, irregular trenches which refill rapidly. Trenches may be cut by hand but this method is slow and it is difficult to cut to the required depth. However, the Alaska Road Commission controls icing on some of its roads entirely by hand trenching.

The equipment most used for steam-jet operation was a quick-acting oil-burning steam generator, which was usually mounted in an enclosed truck. The factory price of this unit was about $3,200. The generators were very effective, producing a large volume of steam within a very short time, and were readily moved from one icing location to another. The apparatus was somewhat complicated and required careful attention for continued trouble-free service. Apparently it has been designed primarily for stationary use, as it was susceptible to damage by rapid movement over rough surfaces.

A number of these units were placed on the highway. Control methods developed with their use proved so superior to other methods that the latter were largely abandoned. The units burned from 50 to 100 gallons of fuel oil per day, depending upon the number of hours that steam was generated. Housing on the trucks prevented freezing on the road, and the trucks were ordinarily driven into heated garages when not being operated. Two men were required for the operation of each unit.

A disadvantage of the equipment was that it was easily damaged and the repairs were sometimes difficult. Delays in making repairs may permit ice formation on the road. Careful and skilled operators are required.

Conclusion

Lasting improvements for the prevention of icing should be adopted in preference to winter control expedients wherever the cost and difficulties of control in winter are large. Such work can be performed best during the summer and early autumn. Some of the measures which may be applied under different conditions are:

1. Improvement of drainage channels and structures.
2. Raising the grade of the road.
3. Construction of dikes to confine the flow of water and ice within certain channels or to divert it elsewhere, and also to act as storage basins for ice formation.
4. Construction of icing basins. Generally, basins are suitable only for very small flows.
5. Construction of subsurface drains. This is a more expensive but permanent cure. Generally it is not suitable in areas of permanently frozen ground.
6. Construction of induced-icing areas.
7. Location of highway wherever possible on higher ground across flats and at considerable distance from a hill or mountain sides. Avoid sidehill cuts.

It is impracticable to prevent icing entirely, but if the roadway surface is to be kept ice-free some icing control is necessary. Three general control methods were in use on the Alaska Highway during the 1943-44 winter:

1. Prevention of icing by artificially warming the flow of water.
2. Periodic removal of the ice formed.
3. Periodic construction or opening up of drainage channels to carry the flow which would otherwise result in icing. The last method appears to be the most efficient but under certain conditions it may be necessary to resort to other methods.

Prepared from a report by W. L. Eager and W. T. Pryor, Highway Engineers, Public Roads Administration. Report is based on studies throughout winter of 1943-44.

Motor-Generator Repair And Maintenance Equipment

The supplementary title of a new 36-page catalog on motor-generator maintenance and repair equipment is "Reconditioning War-Weary Machines". Many motors and generators have carried an excessive burden during the past few years, and they must have regular and attentive care to prevent costly shut-downs. The line of Ideal resurfacers and commutator cleaning stones, grinders and undercutters, and other repair equipment to keep motors and generators running efficiently is described and illustrated in this new catalog which also contains many hints on their proper care.

Copies of this catalog "Modern Motor-Generator Maintenance and Repair Equipment" may be secured direct from the Ideal Commutator Dresser Co., Sycamore, Ill., by mentioning this item.

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- Patented construction which includes a self-mousing action, provides true alignment of load and hoist; eliminates load slippage and hook straightening.
- Shearing of pin would fail to dislodge load. Safety shoulders and lip lock would still hold.
- No snagging on hatches, cornices, etc.—a common fault in ordinary hooks.
- Each size of ACLC Safety Hoist Hook replaces 4 sizes of ordinary hooks, resulting in SUBSTANTIAL SAVINGS in inventory.
- While ordinary hooks require 4 to 5 pounds of metal per ton load lift, ACLC Hooks require less than 1 pound.

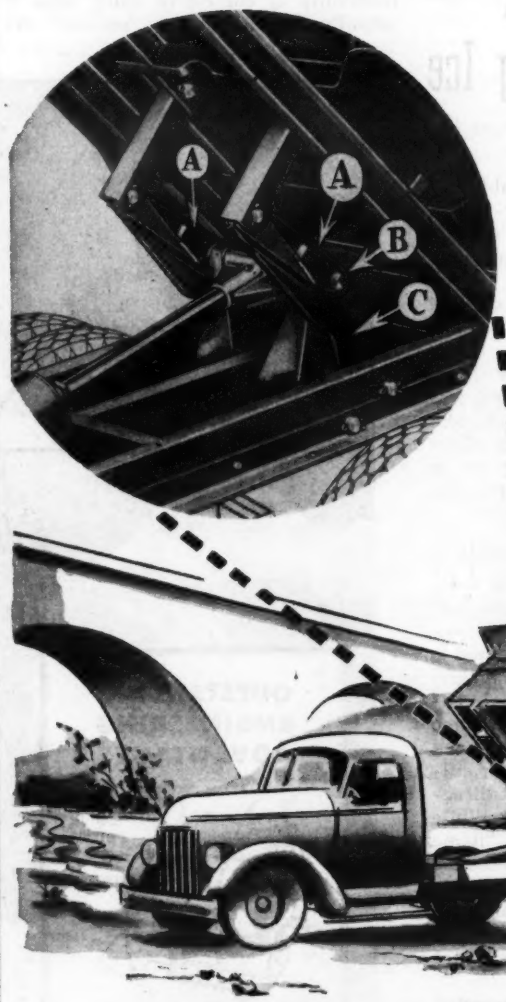
Send for Illustrated Folder . . .

American CHAIN LADDER Company Inc.

151 East 50th Street New York 22, N. Y.

Why ANTHONY HYDRAULIC REG. U.S. PAT. OFF.

TRUCK EQUIPMENT

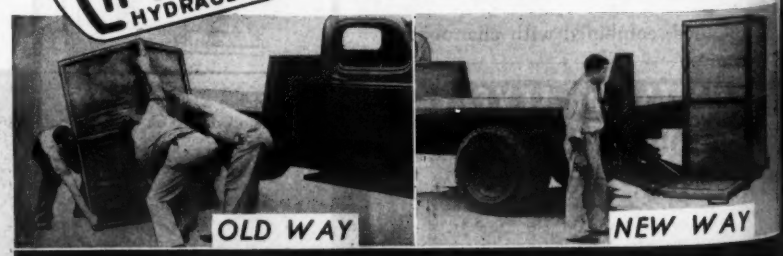


Anthony Features of design and construction are the result of firsthand knowledge of job needs and customer requirements.

For example: This X-ray illustration shows the DOUBLE ARM "POWER SPEED" LIFT of the SUPER Hoist. Proved in the field through years of service. The steady, constant change in movement of piston and lift leverage compounds the power to give Anthony hoists a tremendous lift advantage at the beginning of the lift, when LOAD IS HEAVIEST, and increasingly faster action as body goes up and load lightens—notice too, the "RUBBER RESTRAINING BLOCKS" inside of links. These prevent "over-run and kick-back", and greatly simplify controlling the load when dumping or spreading materials.

HOISTS and BODIES FOR ALL Motor Trucks • Six Wheelers • Semi-Trailers

ANTHONY LIFT GATE HYDRAULIC SOLVES A MANPOWER PROBLEM



ANTHONY COMPANY

STREATOR ILLINOIS

Anticipated Volumes Of Post-War Projects

(*Continued from page* 1)

ORS AND ENGINEERS MONTHLY does not over industrial and other private or ublic-works building construction.

Public Utilities

The estimates in the utility field are ased primarily on past records of con-truction expenditures, in conjunction ith such additional information as ould be obtained from trade associa-ions and the headquarters offices of ational utility companies. No attempt as made to canvass the individual perating companies. Post-war plans re still rather uncertain in this field, lthough it includes companies long oted for their careful planning of capi-al-expenditure programs. There has een extensive study of possible im-rovement programs and fair progress n planning specific projects but, for he most part, final decisions on the cale of expenditures remain to be ade. Furthermore, in some cases de-isions between alternative ways of ac-omplishing a given purpose will prob-bly be postponed until the post-war eriod, especially in the communica-ions field. This will permit comparison f the various tentative plans on the asis of current cost levels, and in the ight of the latest technical develop-ents which might affect the decisions.

Subject to these qualifications, it is xpected that the average volume of tility construction started in the first ive post-war years will be about 1,140,000,000. A substantial part of tility construction at any time consists f extension of distribution facilities to dditional customers. Another sub-tantial part consists of improvements o the general plant, in most cases indi-idually rather small, to bring it into etter balance with the load upon it.

Railroads

Railroad construction is estimated at n average of $360,000,000 per year, ade up for the most part of fairly mall jobs. Most of this will be non-uilding work carried out on the road-ed, on bridges, and on signal and other ommunication and control facilities. ts purpose will be to facilitate opera-ion, correct causes of delays or con-estion, improve safety, and reduce aintenance costs. Those familiar with he field believe that the larger projects ill not be undertaken until a later eriod. It is very likely that there will e some construction of shops and serv-ce pits specially designed for diesel ocomotives and other new-type equip-ent, but this work will be a small part f the construction program.

Local Transit

There is every indication of a large apital improvement program for local ransit systems, but in most localities his will consist almost exclusively of he purchase of new buses and street-ars, and construction will be limited rincipally to shops, garages, and other upplementary facilities. No instances re known in which major extensions of ar tracks are contemplated. It is like-y, however, that there will be cases of ajor track reconstruction or reloca-ion in conjunction with the improve-ent of principal urban traffic routes, o fit the streetcar routes into the mas-er traffic plans being carried out. There ill also be fairly extensive overhead onstruction for trolley buses in a num-er of localities, but this type of work s relatively minor in proportion to the ileage provided.

The only major construction projects n prospect are in New York City and hicago, where the work will be anced with public funds. The pro-gram of the New York City Planning Commission includes capital expenditures of somewhat over $125,000,000 for local transportation, of which roughly $100,000,000 is for construction. Although city appropriations for this program are some $65,000,000 to date, execution as proposed is dependent on Federal grants of about $45,000,000 as well as on additional city appropriations. The construction work contemplated consists of miscellaneous improvements to present plant, a number of connecting links to join portions of the city-owned subway and elevated system, and one major extension to that system.

The Chicago program includes completion of the initial part of the west-side subway which had been under construction as a PWA project until work was stopped by the war. Subways have been proposed or are under discussion in several other cities, but it seems somewhat unlikely that any of these will be started within the period covered by the estimate.

Communications

A large construction program in the communications field is scheduled, estimated tentatively at an average of $350,000,000 per year for the first five years after the war. Additional message capacity; service to additional users, and facilities for new types of service will be obtained in part by additional equipment and in part by construction, of which the largest single element is likely to be overhead and underground cable lines. Although buildings of several types will be needed, they will constitute a minor part of total construction.

Gas, Electric Service, Pipe Lines

No compilations are available on proposed construction by gas companies, but there are indications that it will be fairly substantial. A considerable part of the new residential building will be on sites already having gas service, but much of it will not be. In addition, gas service will be wanted for some war-built housing projects now using bottled gas. Where there is retained population growth or increase in industrial use, the additional consumption will in some cases necessitate new generating and storage facilities, and additional capacity for the mains. Construction cost of this work is estimated at $75,000,000 per year.

After the war there will be need for electric light and power service to both new and growing areas, as well as increased service to older areas with increasing levels of consumption, and some replacement of obsolete plant. The extent to which additional generating plant will be needed is not known. Recently, current consumption declined somewhat from its wartime peak, but the long-range trend is consistently upward. In the absence of more concrete information, the volume is estimated at $300,000,000 per year.

Pipe-line construction is estimated at only about $25,000,000 per year, in the absence of other information. This would consist primarily of extensions

(*Continued on next page*)

WITH A

Good Roads Champion

MODEL BK-44

TRUCK-MOUNTED SPREADER

Safe motor travel . . . safe plane landings . . . are absolute certainties when the big BK-44 tames the twin terrors . . . ice and sleet . . . with anti-skid materials.

The Good Roads Champion Model BK-44 spreads sand, gravel, cinders, calcium chloride or salt—wet or dry—thoroughly and evenly with blanket-like effect.

Spread width is easily adapted to an airport runway, a single traffic lane on a country highway or an urban street, curb to curb . . . each receives an accurately controlled, evenly distributed layer of abrasives or chemicals.

The width of the spread is unaffected by the truck speed for it is controlled entirely by the independent power plant to meet and master any hazardous condition encountered.

For complete details write for folder No. 116

GOOD ROADS MACHINERY CORP.

Kennett Square • Pennsylvania

ESTABLISHED 1878

GOOD ROADS BUILDS CHAMPIONS

Anticipated Volumes Of Post-War Projects

(*Continued from preceding page*)

of existing lines, and construction of collecting lines in oil and gas-producing areas. Financial success of the "Big Inch" line has been so very much greater than was expected that it would seem to presage construction of other interregional lines, but this may not be the case. Continuous operation at full capacity will be considerably more difficult to maintain now than under wartime controls, and a larger fleet of tankers than ever before will be available. Consequently, no lines of this type have been included in the estimate.

Highways, Streets, and Roads

The most important single element of public construction will be highway, street, and road work. As of May 1, 1945, state highway projects in the completed-plans stage ,ready for letting amounted to $652,000,000. Highway, street, and road projects not in the state and Federal-Aid systems which were in the preliminary planning stage or beyond have been reported to the Federal Works Agency and Census Bureau as somewhat over $1,500,000,000 in estimated cost, exclusive of land. Plans have been completed for about 15 per cent and are in progress for another 25 per cent. These figures include bridges, viaducts, and grade separations as well as grading and paving.

The total of all new highways and related construction may be estimated at an average of $1,300,000,000 per year, at 1940 price levels. In addition, there will be a large volume of maintenance. Definitions of maintenance vary somewhat among state highway departments and other bodies carrying on road work, but in general it is regarded as prevention and correction of deterioration by repairs, patching, and routine operations, such as periodical scraping of gravel surfaces. Even during the curtailments of the war years such maintenance has been above $400,000,000 in value per year. It is likely that an average annual expenditure will be $600,000,000 in the first five post-war years, in part for current needs and in part to overcome the deterioration resulting from past curtailments and from heavy concentration of war traffic.

Military and Naval Construction

Military and naval construction in continental United States will probably be fairly small, about $60,000,000 per year, since curtailment rather than expansion of the total military and naval establishment is expected. This work is likely to consist largely of improvement to existing establishments to make them better suited for post-war operation.

Airport Construction

There will certainly be a large public construction program for aviation facilities, for which a tentative estimate of $75,000,000 per year is made. Large expansion of commercial aviation over pre-war levels may be expected, as well as some expansion of private flying. The wartime construction has been enormous, but with some exceptions military requirements meant location of new fields where they will have but limited value for post-war civilian use.

Whatever the extent of the program authorized by Congress, it seems likely to consist of two principal types of facilities. One is metropolitan airports capable of accommodating the largest planes and the heaviest traffic volume, to be built close to the center of the city. Average construction will be about $20,000,000 each. Because of the area required, these can be built only in cities located on suitable bodies of water where land can be created by filling in. The cost of buying a sufficient area of improved property near the downtown section, on which it would be necessary to demolish all buildings, would obviously be prohibitive. The second group includes smaller airports on natural land, in several size groups intended for corresponding classes of expected traffic volume. The preliminary estimate of construction cost for these is from $80,000 to $360,000 each, depending on size.

Reclamation and Conservation

Comprehensive plans for reclamation, conservation, and development work have been prepared by the U. S. Army Corps of Engineers and by the Bureau of Reclamation, and construction can therefore be started on short notice. The purposes to be served by the large projects proposed, of the TVA type, and the St. Lawrence Seaway include improvement of navigation, flood control, erosion control, and soil improvement; irrigation; the generation, transmission, and distribution of electric power; and the provision of recreational areas. Some projects will serve a single purpose, particularly improvement of navigation, while others will contribute to most if not all of those listed.

Public policy on expenditures will affect the volume of work on projects within this general classification more than on most others. There is seldom the immediate urgency that there is, for example, for relief of overcrowded schools or hospitals. Results of earlier development work, and particularly the value of many of the completed projects to the war-production program, have been an effective demonstration that these undertakings augment the nation's resources and productive capacity. Hence there seems to be little chance that they will be regarded merely as a means of creating employment and stimulating business. An average volume of $350,000,000 annually during the first five post-war years is estimated, with a range from $275,000,000 in the first year to $400,000,000 in the fourth and also in the fifth year.

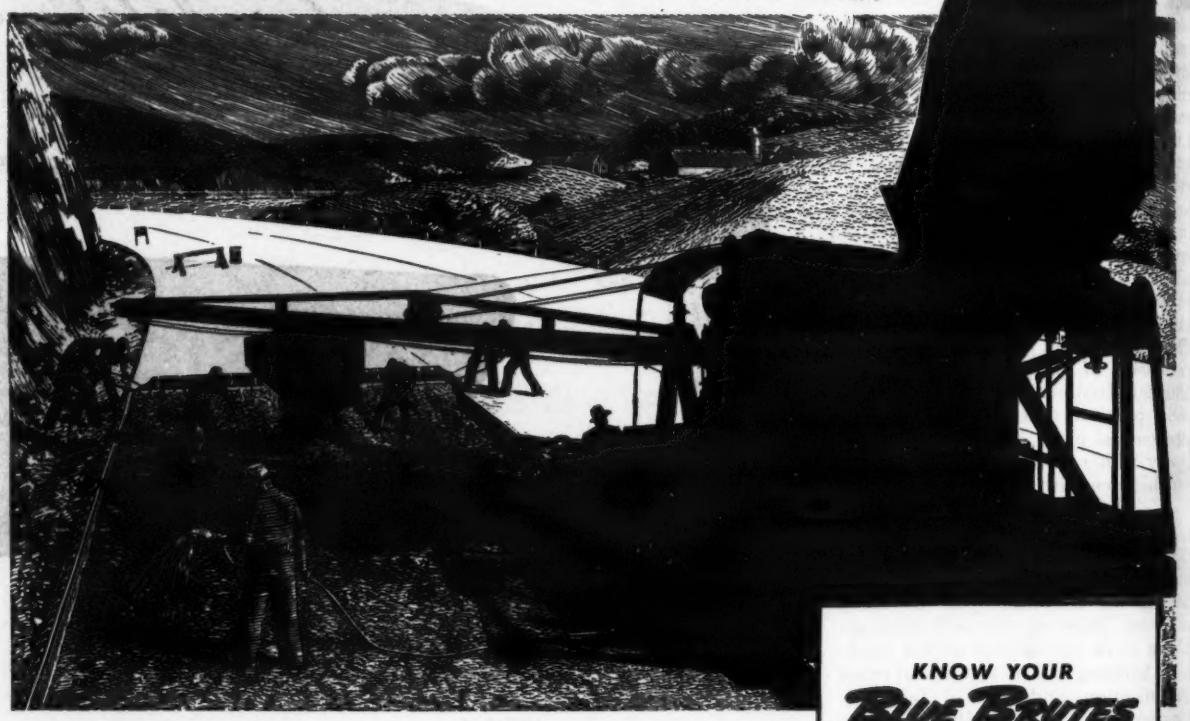
Sewer and Water Facilities

Sewer, sanitation, and water-supply projects are local undertakings, except that in metropolitan areas they are not uncommonly constructed and operated by special districts for several municipalities and the intervening unincorporated territory. Their importance, particularly as regards sewage-treatment facilities, is considerably more than local because of the effect on other localities.

After the war there will be extension of service to growing neighborhoods, both those formerly dormant and those entirely new, and provision of public facilities, especially for sewage, in smaller municipalities formerly lacking such improvement. In cities already provided with water and sewage service there will be development of new sources of water supply, increase of capacity for pumping stations and primary distribution mains, construction

(*Concluded on next page*)

EXTRA SPEED IN ITS FAST-CHARGING SKIP



There are many reasons why this Ransome 34-ft. E Blue Brute "Dual Drum" Paver has the reputation for laying more footage per day than any other paver. But let's start at the beginning . . . with the skip.

Because the drum that receives the charge has a larger opening than other pavers, the skip's throat is wider. Add a 56 degree skip slope . . . steepest on any paver . . . and you can see why the charge wastes no time entering the mixer drum.

SKIP IS FOOL-PROOF, TOO

Slotted pivot bearings that allow skip to adjust itself on uneven subgrade to prevent warping and twisting when batch trucks back into it . . . *6" grill* that prevents damaging foreign material from entering mixer with aggregate . . . *low overhead framework* that permits paver to move through limited clearances — these features give extra insurance of trouble-free operation and longer life.

OTHER EXCLUSIVE BLUE BRUTE FEATURES

This "Dual Drum" Paver also has *hydraulically-controlled boom bucket* for laying any part of load where you want it even while speedy *hydraulically-operated boom* is swinging . . . *renewable boom track* . . . *metal-to-metal spiral cut-off in tank* for continued precision of water measuring . . . *mechanically-operated batch meter* for all-season accuracy — all adding up to more footage per day and lower maintenance cost per year.

RB-1

KNOW YOUR BLUE BRUTES

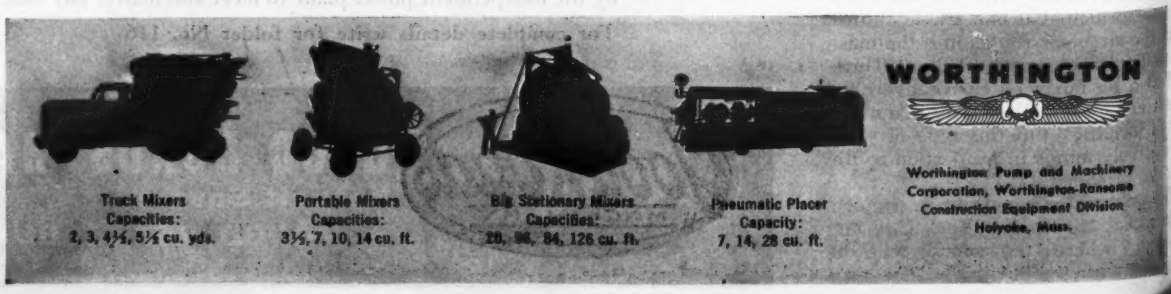
Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute construction equipment will put your planning on a profitable basis and prove that *there's more worth in Worthington-Ransome.* Act now! His name is listed on page 33. The number beside his name indicates the Blue Brutes he handles.

1. Blue Brutes include: Pavers, Concrete Spreaders**, Concrete Mixers, Concrete Placing Equipment, Big Mixers, Finishing Machines**, Pneumatic Placing & Grouting Equipment, Truck Mixers, Plaster & Bituminous Mixers, and accessories.

2. Blue Brutes also include: Diesel, gasoline and electric driven Portable Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs; Rock Drills and Air Tools in a wide range of weights and sizes; Contractors' Pumps.**

**Postwar Products

BUY BLUE BRUTES



Truck Mixers Capacities: 2, 3, 4½, 5½ cu. yds.

Portable Mixers Capacities: 3½, 7, 10, 14 cu. ft.

Big Stationary Mixers Capacities: 28, 56, 84, 126 cu. ft.

Pneumatic Placer Capacity: 7, 14, 28 cu. ft.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division Holyoke, Mass.

Anticipated Volumes Of Post-War Projects

(Continued from preceding page)

of water-treatment plants, and construction or enlargement of sewage-treatment plants. Considerably greater attention than in the past is likely to be given to the treatment of industrial wastes, with provision made in part through public plants and in part through private facilities at industrial establishments producing objectionable liquids.

As might be surmised, sustained level for sewer and water construction was greatest during the pre-depression period when residential and other building was at its height and when urban subdivisions were being marketed in greatest number. From 1925 through 1929, the average annual volume was about $180,000,000 for sewer construction and about $155,000,000 for water. The estimated annual averages during the first five years after the war are, respectively, $200,000,000 for sewage facilities and $150,000,000 for water.

Financing should present no difficulties for any justified project. Water service is a revenue-producing utility, and a considerable part of the cost of sewer work is paid from special assessments or through one of several forms of "sewer rental" by which property owners or occupants are charged separately for sewage service.

Parks and Recreational Facilities

This work consists, in part, of buildings such as auditoriums, field houses, and shelters, and, in part, of grading, landscaping, construction of swimming pools and beaches, and other outdoor work. The expenditure level for buildings alone rose rather consistently during the 1920's to a peak of $56,000,000 in 1928 and then, after depression curtailment, increased again with somewhat less regularity through 1939. Recent newspaper accounts show strong public support for some proposed projects. Nevertheless, this is one of the smaller classes of public construction and one likely to be subordinated to schools, hospitals, and other types of work which are generally regarded as more urgent. Volume is estimated at $70,000,000 per year.

Osgood and General Announce New Dealers

The appointment of several new distributors of Osgood and General construction, excavating, and materials-handling equipment has been announced jointly by the Osgood Co. and General Excavator Co., both of Marion, Ohio. These new dealers include: Allied Equipment, Inc., Miami, Fla., which has taken over the Osgood-General franchise in southeast Florida; Don Graze, Jacksonville, Fla., in northern Florida; the Texas Railway Equipment Co., Houston, Texas, for the Houston area; the Van de Water Co., of Walden and Schenectady, N. Y., to serve Sullivan, Ulster, and Orange Counties in that state; and Gibson-Stewart Co., Cleveland, Ohio, in Ohio.

All of these new distributors are prepared to provide complete information on the many new machines and design developments being planned by both Osgood and General Excavator, including the new General Type 10 one-man-operated one-engine-controlled pneumatic-tire-mounted all-purpose unit and the Osgood Type 100 shovel, dragline, clamshell, and crane.

Chilean Irrigation Project

The construction of a canal to irrigate 108,000 acres near the cities of Mulchen and Angol, Chile, is reported in a recent issue of *Foreign Commerce Weekly*. The canal will be the largest in that country. According to the Chilean press, funds for the project have been allotted from this year's budget, and work is expected to begin this month.

Worthington-Ransome Blue Brute Distributors

By referring to the advertisement on page 32, you'll learn the meaning of the (1), (2) or (1-2) beside their names.

Ala., Birmingham (1) J. D. Pittman Tractor Co.
Ariz., Phoenix (2) Smith Booth Usher Co.
Ark., Fort Smith (2) R. A. Young & Son
Little Rock (1) Kern-Limerick, Inc.
Little Rock (2) R. A. Young & Son
Calif., Los Angeles (1) Garlinghouse Bros.
Los Angeles (1-2) Smith Booth Usher Co.
San Francisco (1-2) Coast Equipment Co.
Colo., Denver (2) John N. Meade
Denver (1-2) Power Equipment Co.
Conn., Hartford (2) The Holmes-Talcott Co.
New Haven (1) W. I. Clark
Waterbury (1) Contractors Supply Co.
D. C., Washington (1) M. A. Doetsch Machinery Co.
Fla., Miami (1-2) Allied Equip. Inc.
Ga., Atlanta (1-2) Tractor & Machinery Co.
Savannah (1) Morgans, Inc.
Ida., Boise (1-2) Olson Manufacturing Co.
Ill., Chicago (1-2) Chicago Construction Equipment Co.
Chicago (2) John A. Roche
Chicago (1) Thomas Hoist Co.
Ind., Fort Wayne (1) American Steel Supply Co.
Indianapolis (2) Reid-Holcomb Co.
Iowa, Des Moines (2) Electric Eng. & Const. Co.
Ky., Harlan (2) Hall Equipment Sales Co.
Louisville (2) T. C. Coleman & Son
Louisville (1) Williams Tractor Co.
Paducah (1) Henry A. Petter Supply Co.
La., New Orleans (1) Ole K. Olson Co.
New Orleans (2) Wm. F. Surgi Equipment Co.
Maine, Portland (1-2) Maine Truck-Tractor Co.
Md., Baltimore (1) Stuart M. Christhilf & Co.
Baltimore (2) D. C. Elphinstone, Inc.
Mass., Boston, Allston (1-2) Clark-Wilcox Co.
Cambridge (2) Field Machinery Co.
Mich., Detroit (1) T. G. Abrams
Dearborn (2) Thomas G. Abrams
Detroit (2) W. H. Anderson Co., Inc.
Flint (2) Gransden-Hall & Co.
Muskegon (1-2) Lakeshore Mach'ry. & Sup. Co.
Minn., Minneapolis (1-2) Phillippi-Murphy Equipt. Co.
St. Paul (2) D. L. O'Brien
Miss., Jackson (1) Jackson Road Equipment Co.
Mo., Clayton (1-2) The Howard Corporation
Kansas City (1) Brown-Strauss Corp.
Kansas City (2) Machinery & Supplies Co.
St. Louis (2) W. H. Reaves
Neb., Lincoln (1) Highway Equipment & Supply Co.
N. J., Hillside (2) P. A. Drobach
Newark (1) Johnson & Dealaman
North Bergen (2) American Air Compressor Corp.
N. M., Albuquerque (2) Bud Fisher Co.
Roswell (2) Smith Machinery Co.
N. Y., Albany (1-2) Milton-Hale Machinery Co.
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New York (2) Air Compressor Rental & Sales
New York (1-2) Hodge & Hammond, Inc.
New York (1-2) Railroad Materials Corporation
Olean (2) Freeborn Equipment
N. C., Raleigh (2) Carolina Tractor & Equipment Co.
Raleigh (1) Smith Equip. Co.
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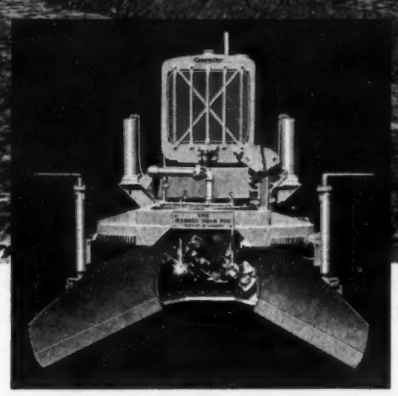
Wash., Seattle (2) Star Machinery Co.
Spokane (2) Andrews Equipment Service
W. Va., Charleston (1) West Virginia Co.
Fairmont (2) Interstate Engineers & Constr., Inc.
Wyoming, Cheyenne (2) Wilson Equipt. & Sup. Co.

Buy Blue Brutes
Worthington Pump and Machinery Corp.
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts



Built by MADSEN

A Road Pug that will mix 7 to 14 cubic feet per running foot with a tonnage capacity ranging from 200 to 550 tons... that's a Madsen. A traveling mix unit that does the work in a single pass over the windrow... that's a Madsen.

The Madsen Road Pug performs these feats every day, day after day, on varied projects throughout the country.

Here's a few reasons why a Madsen Road Pug has no equal for producing low cost, well mixed road base and surface material for secondary roads and airport runways.

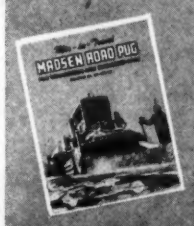
ACCURATE CONTROL: The volume of oil is mechanically synchronized to the speed of the Road Pug and is adjusted to the volume of the windrow by the Madsen-patented volume metering pump.

ALWAYS WORKING: The Road Pug travels at a speed ranging from 5 to 40 feet per minute while it picks up, thoroughly mixes and then discharges the aggregate. This action continues without halting the operation for Road Oil. The Road Pug's supply is easily replenished in transit without slowing down.

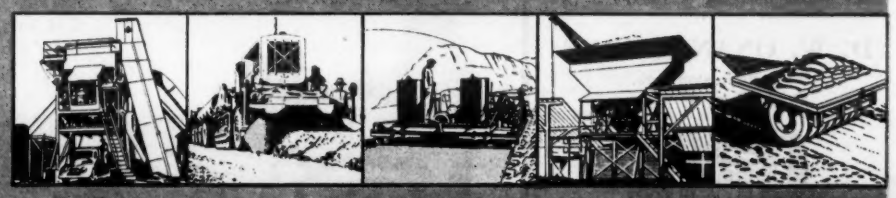
The Madsen Road Pug has time-tested features to assure long-lived sure-fire operation. You can learn more about Madsen Road Pugs by writing for Bulletin No. MP-120-63.

MADSEN ROAD PUG MIX-IN-TRAVEL UNIT

MADSEN IRON WORKS
HUNTINGTON PARK, CALIFORNIA



Write for Catalog



MADSEN ASPHALT PLANTS • ROAD PUGS • CEMENT FINISHERS • BATCHERS • COMPACTORS

Aggregates Produced For Road Maintenance

Stone-Cement Is Used for Patching; Quarries Supply Materials for Varied Work; 60,000 Miles in System

✦ THE problems involved in the maintenance of the amazing total of 60,000 miles of roads serving an area of 52,426 square miles from Cape Hatteras on the Atlantic to the Great Smoky Mountains at the Tennessee border are great. This extensive road mileage in North Carolina results from having all county roads under the jurisdiction of the State Highway Commission which constructs and maintains everything from dirt lanes to concrete highways. Broken down, this figure is divided into 10,000 miles of state roads, 2,000 miles of city streets, and 48,000 miles of secondary or county roads.

For each of the next two years approximately $40,000,000 has been appropriated by the North Carolina General Assembly to finance a large maintenance and road-improvement program, with $5,000,000 of that sum earmarked annually for county-road improvements. This is in addition to the regular secondary-road construction program which will involve approximately $9,000,000 annually, most of which will be used on county roads. The $40,000,000 referred to does not include Federal-Aid funds of which the allocation to North Carolina each year for a three-year period will be $11,479,000.

With regard to highway maintenance, the Commission has been in the peculiar position of having money to spend for road repairs, but unable to do so because of the lack of sufficient labor and equipment. The wartime labor shortage can be appreciated with the realization that in June, 1941, the State had 10,243 maintenance employees in addition to 6,584 convicts on maintenance work, while in December, 1944, there were only 5,411 maintenance employees and 4,086 prisoners on maintenance work of all kinds. This has been the biggest bottleneck of all in keeping the roads in shape.

During the winter months, work is confined to clearing the right-of-way, cleaning ditches, and grade slopes. With better weather, the patching of roads is started, for unless the road is in very bad shape patching is done only from the beginning of April until the end of November.

Base Patching

A typical patching job was done early in April on a secondary county road south of Durham, N. C., east of and parallel to State Route 55. This 7-mile stretch from the Durham city line to the intersection of State Route 54 was originally a 12-foot macadam road, 8 inches thick, which was widened in 1938 to 18 feet by building two 3-foot side strips of stabilized soil, after which the entire surface was covered with 1½ inches of bituminous treatment.

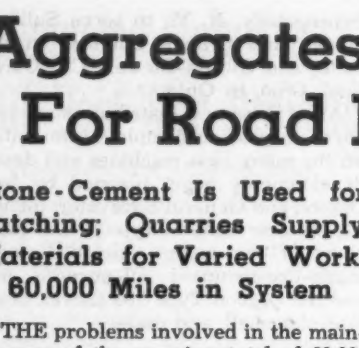
The areas in need of patching were determined by the Maintenance Supervisor and the District Engineer who went over the road with the foreman of the road crew and marked out the sections to be removed. These failures varied in size from small areas about a foot square to a maximum patch 312 x 5 feet. One crew of 11 men equipped with two Worthington No. 10 pavement breakers with spade ends, powered by a LeRoi-Rix 210-cfm portable air compressor, removed the cracked pavement. The fragments were either wasted along the side of the road or else hauled away to widen a nearby fill section. The depth of excavation for these patches averaged 15 inches, which was about 5 inches below the bottom of the old pavement.

To mix the patching material, a plan was set up on a bank about a mile fro the south end of the road being re paired. A crew of 12 convicts mixe Incor high-early-strength cement wit stone screenings, 100 per cent passin the 3/16-inch mesh, in a CMC 10-S concrete mixer powered by a LeRo engine. The mix consisted of 10 per ce cement and 90 per cent screenings; th latter was purchased as rejects from nearby commercial quarry. To 1 sac of cement was added 4 wheelbarrows o screenings and 10 gallons of wate which gave a very dry mix. The mixe was without a water tank, but wate was poured into the drum by bucke from five barrels which were kept fille from a 500-gallon tank mounted on Chevrolet truck, water being pumpe into the tank from a creek a short dis tance from the plant.

Placing Patch Material

From its position on the bank, th

(Continued on next page)



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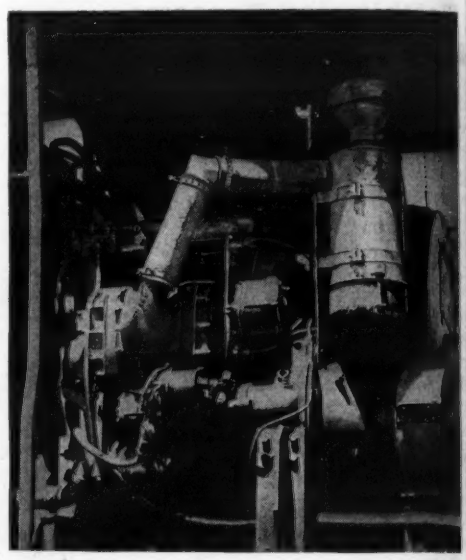

"NEVER failed me once," says Mr. Rexroth, California contractor, speaking of the General Motors Diesel in his crane. "And it's nothing for that Diesel to lift 100 yards of dirt an hour, ten, fifteen and twenty hours a day."

That's because these high-powered two-cycle Diesels accelerate rapidly —they're quick on the trigger. Their higher horsepower per pound of weight delivers a powerful punch. The flexibility of these engines makes it possible to handle intermittent loads with ease. Until recently every GM Diesel we could make went into war work. *Now they are available again for peacetime work—available and ready to provide construction contractors with rugged power that is low in cost and high in reliability.*

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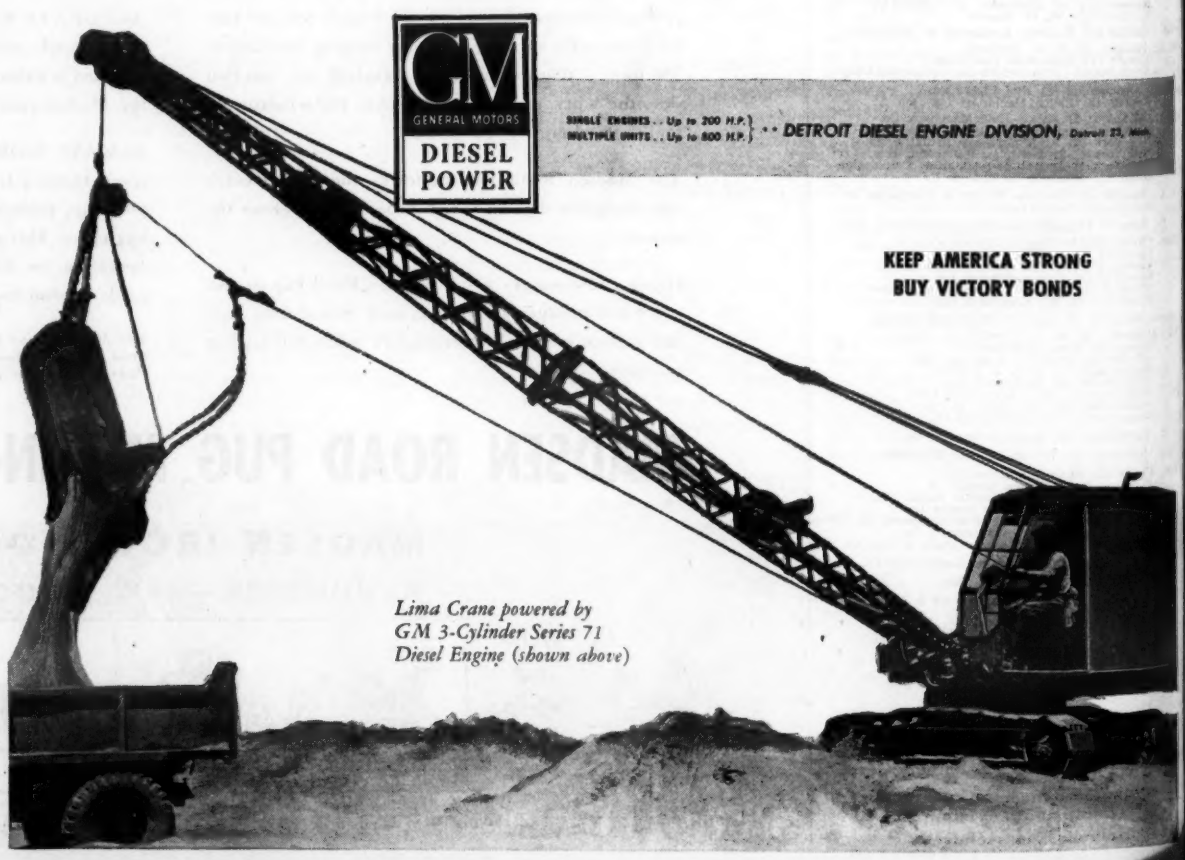
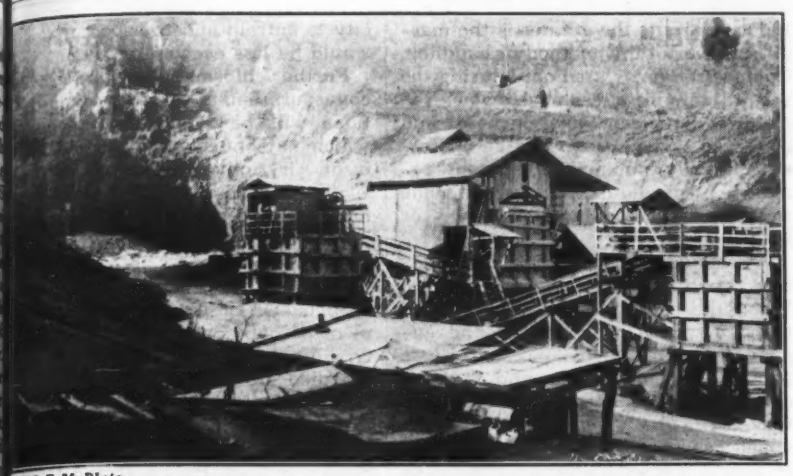


Lima Crane powered by GM 3-Cylinder Series 71 Diesel Engine (shown above)



C. & E. M. Photo
Woodlawn Quarry, North Carolina's largest state-owned aggregate-production plant, is a well housed permanent set-up.

Aggregate Production For Road Maintenance

(Continued from preceding page)

mixer unloaded the patching material into five Chevrolet dump trucks which hauled as much as 2½ tons of the cement-mix at a time. The material was dumped alongside the holes to be patched and shoveled in to make a layer about 3 inches deep of loose material. This layer was compacted to 1½ inches by two Chicago Pneumatic tampers, one with a 4-inch and the other with a 5½-inch-diameter base, powered by a Chicago Pneumatic portable air compressor of 105-cfm capacity, driven by a 6-cylinder Hercules engine. Nine men worked in this crew. Enough layers of the mix were added to bring the patching material up to 1½ inches below the level of the surface of the road, whereupon the patches were rolled by a Galion 2½ to 3-ton portable roller which can be picked up and towed behind a truck on its 2-wheel carriage. The remaining 1½ inches was filled with bituminous cold-mix. The entire crew on this project were convicts with the exception of the foreman, J. L. Davis, the mixer operator, and the truck drivers.

State Quarries

Much of the stone used for maintenance on these roads, both for patching and surfacing, comes from state-owned and operated quarries, a typical one being located 3 miles south of Graham off State Route 87 in Alamance County. The blue granite is drilled by a Chicago Pneumatic 350-pound tripod drill, beginning with 2½-inch bits. Air is furnished by a Gardner-Denver 210-cfm compressor. Hercules dynamite is used for blasting, and the broken rock is loaded by a P&H ½-yard shovel into four 1½-yard Dempster-Dumpster skips which are then conveyed by a 1½-ton truck to the crusher.

The rock is dumped into a hopper which feeds a Good Roads Champion 10 x 30-inch jaw crusher driven through a 10-inch belt by an Allis-Chalmers E-60 4-cylinder engine. From this crusher the stone is carried by a 20-foot elevator, operating off the shaft of the crusher, to a rotary screen 12 feet long and 30 inches in diameter, made of four 3-foot sections in sizes ¼, ½, and 1-inch, with a dust screen 42 inches in diameter over the end section. Rejects from this screen are carried on a 30-foot belt conveyor 18 inches wide to a Universal 9 x 16-inch crusher driven by an International 40-hp 4-cylinder engine. This recrushed stone then goes to the rotary screen. The stone passing the screen drops into a 120-cubic-yard bin.

Woodlawn Quarry

One of the largest state-owned quarries is the Woodlawn lime and stone quarry in District 3 of Division 9, 8 miles north of Marion on U. S. 221 in the western part of the state. Here the State has acquired 200 acres of land and at present is working a 200-foot limestone face. Drilling equipment consists of an Ingersoll-Rand and a Worthington 68-pound drill powered by a Worthington 330-cfm compressor, with a LeRoi 210-cfm compressor also available. Holes are drilled to a depth of 20 feet and filled with 25 pounds of Hercules 40 per cent dynamite.

A Hanson ½-yard shovel loads the broken rock into three Dempster-Dumpster 1-yard buckets which are picked up and taken to the crusher, a few hundred feet away, by a Ford 1½-ton truck. The primary unit is a Diamond 18 x 36-inch jaw crusher from which the stone is carried on a 35-foot bucket elevator to a 3-deck Lippmann 4 x 12-foot vibrating screen. Tailings are returned on a belt conveyor, 24 inches wide x 60 feet long, to a Diamond 30-inch roll crusher. The stone being crushed is washed on a steep chute before it is carried by an 80-foot belt, 16 inches wide, to a 50-ton bin where it is earmarked as No. 9 road aggregate for road-oil treatment, which passes the ½-inch screen and is retained on the No. 10 screen. Screenings are salvaged from the base of the washer and delivered by a 30-foot bucket elevator to a 20-ton bin. Water for washing comes from a creek at the foot of the hill on which the crusher is located, and is pumped through 2,000 feet of 6-inch cast-iron pipe by a 4-inch Worthington pump, driven by an

(Concluded on next page)

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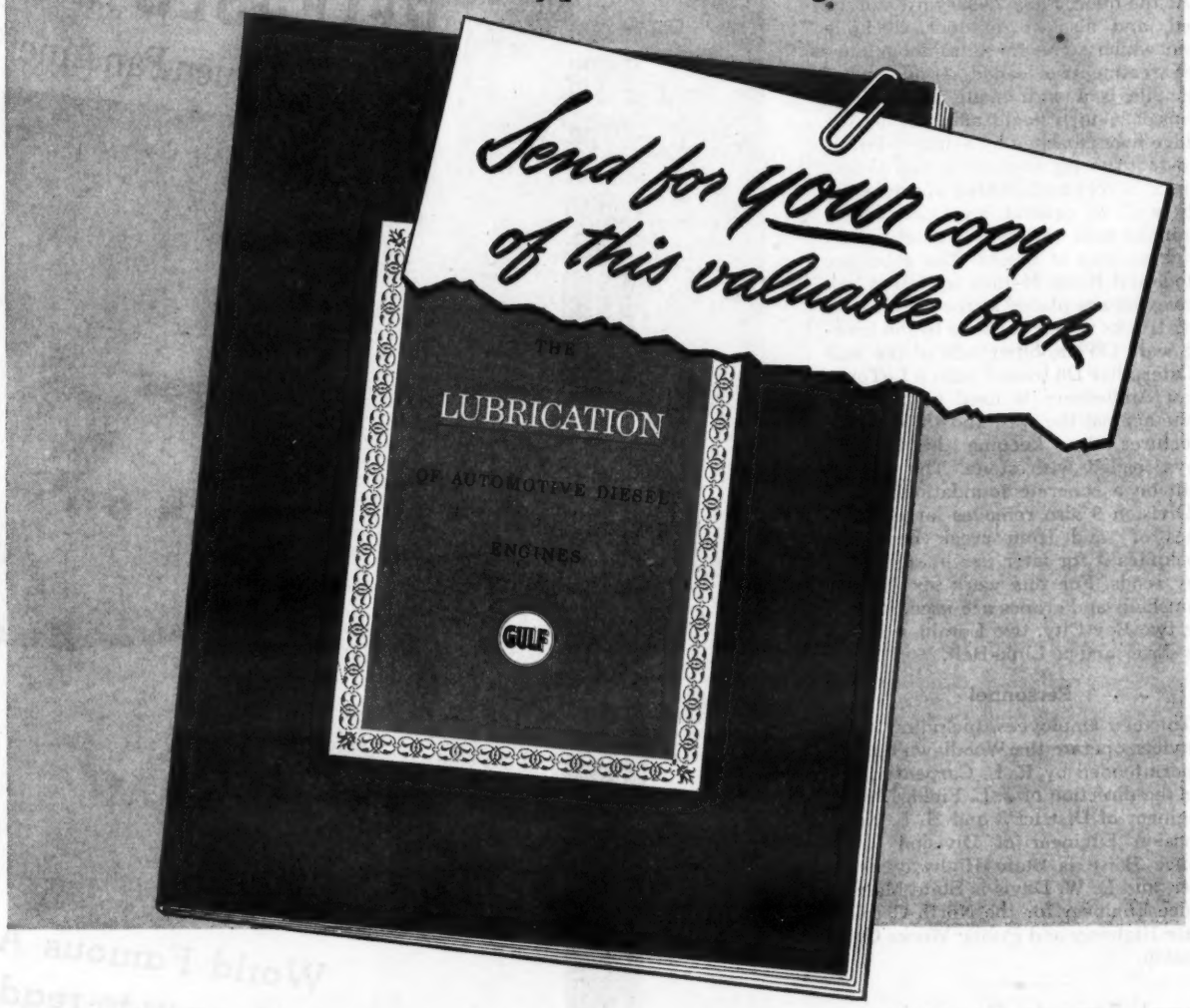
Memo to operators of
Automotive-type Diesel engines:



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Aggregate Production For Road Maintenance

(*Continued from preceding page*)

International 40-hp 4-cylinder engine, to a 6,000-gallon concrete reservoir above the crusher.

A Caterpillar D13,000 diesel engine of 125 hp is the prime mover for the crushers while the conveyors are operated by a 25-hp and a 15-hp gas engine. An Allis-Chalmers E-60 engine drives a Gilson hammermill pulverizer for making agricultural lime, 100 per cent of which passes the No. 10 sieve and is stored in a Diamond 25-ton bin.

This crushing plant, which has a capacity of 45 tons per hour, is equipped with a large magnet, set up over the conveyor leading to the roll crusher, to pick up any pieces of metal which might fall into and damage this unit. The magnet is 20 inches long x 12 inches in diameter, made with three coils, and has a total weight of 400 pounds. It is charged by a G-E generator and is particularly useful in picking out steel drill bits which may be tossed in with the stone chunks to cause a shutdown at the quarry.

At the quarry is a 2,000-yard storage shed, and also an outdoor stockpile from which stone for bituminous surface treatments is loaded. At one end of this pile is a wall made from 2-foot strips of ¼-inch steel traffic treads from bridge floors, backed by 8-inch I-beams at 2-foot spacing to make a wall 45 feet long x 15 feet high. Three apertures in this wall at ground level, or below, equipped with vertical lift gates permit quick loading of trucks. The gates are lifted, and Haiss 24-inch x 24-foot belt conveyors are placed at the openings to feed trucks which back up to the loading wall. On the other side of the wall a Caterpillar D6 tractor with a LeTourneau Angledozer is used to push the stone against the wall and through the apertures, thus keeping the belt always loaded with stone. The wall is built on a concrete foundation.

Division 9 also removes large quantities of sand from creek beds and stockpiles it for later use in stabilizing clay roads. For this work six ½-yard clamshells and cranes are used, including two Bay City, two Lorain, a Bucyrus-Erie, and a Link-Belt.

Personnel

Thirteen employees, including seven convicts, operate the Woodlawn quarry, superintended by R. L. Carpenter, under the direction of J. L. Field, District Engineer of District 3 and H. E. Noell, Division Engineer of Division 9. W. Vance Baise is State Highway Engineer, and B. W. Davis is State Maintenance Engineer for the North Carolina State Highway and Public Works Commission.

Legal Aspects Governing Highway-Access Control

Public highway officials and engineers will be interested in a 46-page study of highway-access control, from the legal point of view, which has been compiled by the Division of Financial and Administrative Research of the Public Roads Administration. Prepared by David R. Levin, Transportation Economist, the book cites actual controversies which have reached the courts, includes conclusions and recommendations based on the experience of Federal, state, and local highway departments throughout the country, and is well illustrated with photographs and diagrams. Costs, right of access, right of view, rules of compensation, and the rights of owners versus public easement are a few of the many topics covered. As stated in the introduction, the primary object of this treatise is to summarize reasonable principles of law concerning injury to property as it may affect proposed modernized public improvements, and to provoke further thought and discussion of the problem.

Post-war planners may secure copies of "Legal Aspects of Controlling Highway Access" from the U. S. Government Printing Office, Washington, D. C. The cost is 15 cents a copy.

Moving Bulk Cement By Air-Activation

Where it is necessary to move large quantities of bulk cement without waste or loss, the Robinson air-activated conveyor system which has no continuously moving parts and is able to handle bulk cement from hopper-bottom cars to storage and from storage to batching plants has many advantages. The cement may be moved wherever a pipe line can be run, and the longer the run or the more tortuous the route the greater is the margin in favor of this method of handling. Compressed air is used only during the several minutes of each cycle when the material is being air-activated and conveyed. The system can be operated manually, automatically, or by remote control, and delivery can be made to any number of receiving bins or hoppers.

Air-activation is the distinctive feature of Robinson conveyor systems. When the conveyor tank, an inverted truncated cone, is filled and the entrance port closed, compressed air is admitted in fine jets around the discharge port located at the base of the tank. The finely pulverized material, which has a tendency to pack, is fluffed up and lightened, forming a fluid mixture of air and solids. As the pressure in the tank increases, the lightened mass flows from the tank and through the pipe line, just as any fluid flows under pressure. Pressure alone, without air-activation, would not be adequate, and volume air at high velocity to entrain and transport the solids would be less economical.

Further information regarding these conveyors and a long list of installations will be found in Bulletin 31[illegible] which may be secured direct from Robinson Air-Activated Conveyor Systems, 205 E. 42nd St., New York 17, N. Y., by mentioning this item.

Michael Sasgen Dies

Michael J. Sasgen, founder and President of both Sasgen Derrick Co. and Grand Specialties Co., both of Chicago, Ill., died on July 27, 1945, following a stroke the previous month. Mr. Sasgen leaves a widow, and two sons, both active in their father's businesses. M. J. Sasgen is Vice President and General Manager of Sasgen Derrick Co., manufacturer of derricks, hoists, and winches, while A. M. Sasgen is Vice President and General Manager of Grand Specialties Co., manufacturer of quick-action clamps, speed vises, engineers' wrenches, and builders' hardware.

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The New Gruen Pan American!
World Famous Aviation Watch with easy-to-read sweep second hand, ideal for professional use!
This is the new watch chosen official timepiece of Pan American World Airways . . . the Gruen Pan American. With its easy-to-read sweep second hand it is ideal for professional use . . . and one of the most talked about watches to come out of the war. It has a special 24-hour dial for AM and PM hours. It tells the new air-world time with uncanny precision accuracy. So great has been the demand by the armed forces for this magnificent timepiece that our entire production of Gruen Pan American watches has been restricted to military needs. But now at last a limited supply will be released to civilians beginning Oct. 1.
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The Gruen Pan American from $39.75 to $119.50. Other Gruen watches at Gruen Jewelers only, including the patented Curvex and patented Veri-Thin, up to $250; with precious stones to $4,000. Prices include Federal Tax. The Gruen Watch Company, Time Hill, Cincinnati, Ohio, U.S.A. In Canada: Toronto, Ontario.
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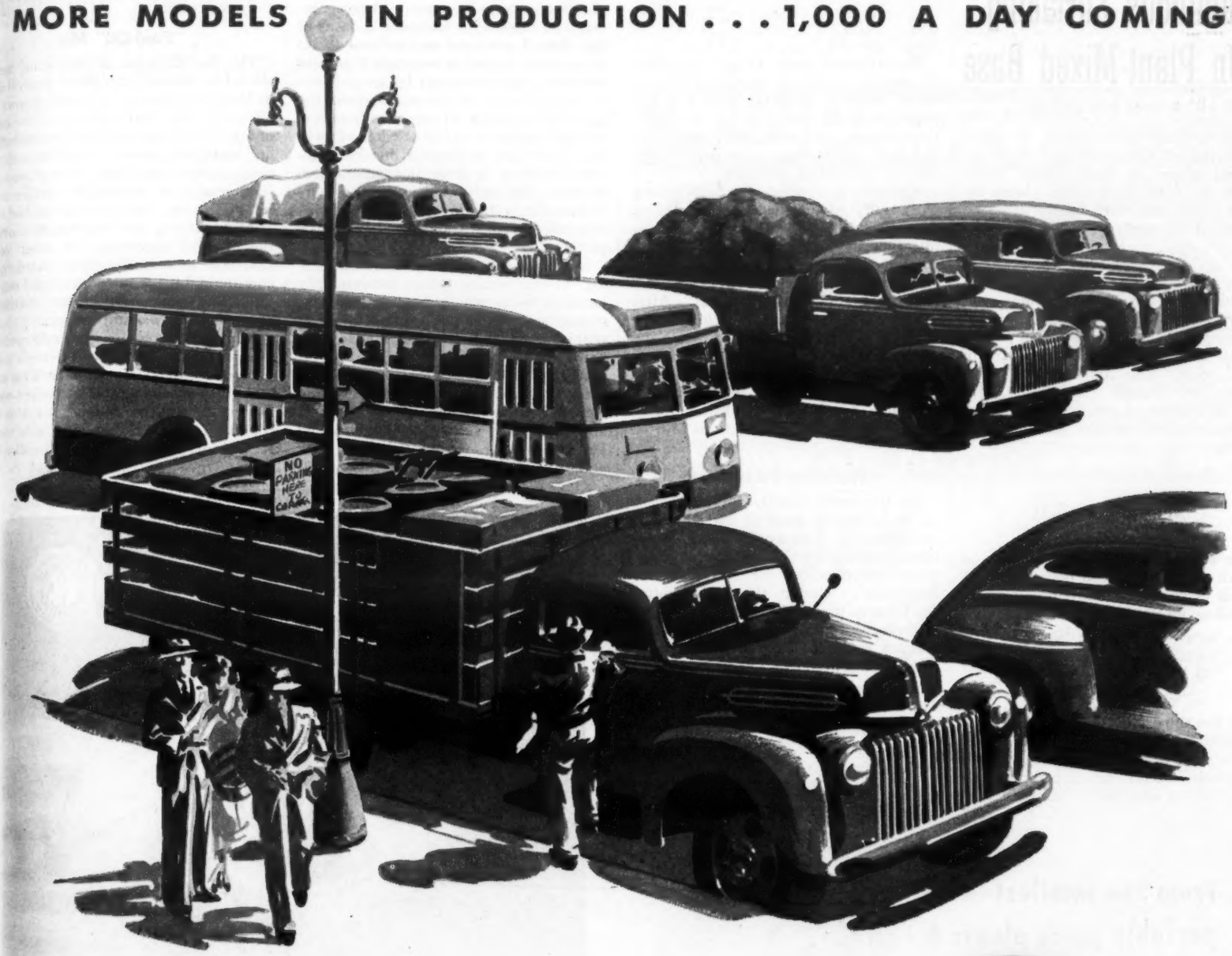


100 H.P. V-8 Ford 90 H.P. SIX

You SEE more Ford Trucks because there are *MORE FORD TRUCKS to SEE!

Ford Trucks are America's Number-One choice—proved by registration figures. And if you've ever owned or operated Ford Trucks you know *why* they're favorites. They save you money—in first cost, operating cost, maintenance cost. They are reliable, durable, simple and easy to service. Wherever you go, there's competent Ford service. There's a Ford Truck among the 42 current models and types that will do a good, efficient, economical job for you. Ask your Ford Dealer to tell you about the many new engineering advancements, and the latest priority regulations.

32 GOOD REASONS WHY TODAY'S NEW FORD TRUCKS ARE THE GREATEST IN FORD HISTORY

THE ENGINE

1. New aluminum alloy cam-ground pistons with 4 rings each—for improved oil control.
2. New steel-cored SILVALOY connecting rod bearings—provide 2½ to 3 times longer life.
3. Larger capacity oil pump—for improved lubrication and longer bearing life.
4. Rear main bearing oil seal—for added oil economy.
5. Oil filter, renewable cartridge type—to keep oil clean and reduce engine wear.
6. Removable plate at bottom of oil pan—for easy access to clean oil pump screen.
7. Balanced carburetion—for increased economy and efficiency.
8. Latest type self-washing oil bath air cleaner—keeps out destructive dirt, thus greatly prolonging engine life.
9. Thermostatically controlled exhaust by-pass valve regulates intake manifold temperature—for better fuel vaporization and economy.
10. Intake manifold—improved design for easy vacuum line connections.
11. New sealed-dry, V-outlet distributor — water-sealed, short-proof, air-cooled, trouble-free—streamline-molded of dielectric bakelite, with neoprene-coated high-tension leads protected by heavy ozone-resistant plastic jackets.
12. New aluminum timing gear—for longer life and silent operation.
13. Valve springs shot-blasted and rust-proofed—for longer life.
14. New stronger piston pins—for longer life.
15. New design interchangeable cylinder heads—for simpler, lower cost servicing.
16. More efficient exhaust valve cooling—for longer valve and cylinder block life.
17. High-efficiency fan—for better cooling.
18. Pressure-valve radiator cap—to prevent loss of coolant and improve engine operating efficiency.
19. New bronze thrust washer in water pumps—to prevent leaks and give longer life.
20. Oil-resistant synthetic rubber engine mounts with new design front cups—for longer life.
21. Oil pan divided at clutch housing—provides easier clutch servicing.

THE CHASSIS

22. Larger clutch in Tonner truck. 44.7% increase in friction area—for longer life.
23. Four-speed transmission now standard in Tonner—for more efficient operation and longer life.
24. Four-speed transmission, internal spring reverse lock—eliminates latch on shift lever.
25. New-design transmission main shaft splines—to provide positive gear mesh under load.
26. Thrust washers added at ends of four-speed transmission countershaft gear—for longer life.
27. Larger tires now standard on all chassis—to obtain maximum life from present-production tires.
28. Wheel rims uniform wide-base on each model—for better tire life and simplified servicing.
29. Two-speed axle vacuum shift—for easier control and elimination of separate shift lever.
30. Additional sill cross-member at rear of cab—for greater stability and longer cab life.
31. Cab door window glass mounted in metal frame—for greater strength to prevent glass breakage.
32. Larger, adjustable-arm rear-view mirror—for increased visibility and safety.

*YEAR AFTER YEAR, OFFICIAL REGISTRATIONS SHOW MORE FORD TRUCKS ON THE ROAD — ON MORE JOBS — FOR MORE GOOD REASONS

Bituminous Surfacing On Plant-Mixed Base

(*Continued from page 6*)

two shop-built distributors, a 1,600-gallon and a 1,100-gallon unit. It is ordinarily done in half-widths under traffic, the screenings being placed by dump trucks with flare-boards attached to control the spread.

Armor Coat

The next heavier surface used on new work is a three-course armor coat, laid over the MC-1 prime coat. For this surfacing, 200 to 300-penetration paving asphalt is applied at a temperature of 375 degrees. The first application is 0.25 gallon, covered immediately with 60 to 70 pounds of crushed-stone chips per square yard, meeting the following grading:

Sieve Size	Per Cent Passing
1-inch	100
¾-inch	95-100
½-inch	25-60
⅜-inch	0-15
No. 4	0-3

The second course is 0.40 gallon of asphalt per square yard covered by 25 pounds of crushed-stone chips meeting the following grading:

Sieve Size	Per Cent Passing
½-inch	100
⅜-inch	90-100
No. 4	0-30
No. 8	0-10
No. 16	0-5

For the third and final course an application of 0.20 gallon of asphalt per square yard is made and covered with 15 pounds of chips which comply with the following specified grading:

Sieve Size	Per Cent Passing
⅜-inch	100
No. 4	60-85
No. 8	0-25
No. 16	0-5

The crushed-stone chips, regardless of grading, must be produced from a tough durable material having a Los Angeles rattler-test loss of not more than 40 per cent after 500 revolutions, and may not contain more than 10 per cent of uncrushed particles.

Asphalt is applied in half-widths, with traffic maintained at all times on the adjacent half of the road. Each application of chips is made through a spreader box pushed ahead of a backing dump truck so that the tires will not touch the uncovered asphalt. After distribution, each course is leveled by a motor grader and a drag broom, and then rolled by steel-wheel rollers weighing at least 5 tons and propelled by engines having not less than four cylinders, to eliminate jerky operation which results in corrugations in the surface.

Plant-Mix Surfacing

On the more heavily traveled roads in the northern part of the county, a surfacing is frequently used which meets the California Division of Highways specification for "Plant-Mixed Surfacing". Under this specification the County uses MC-3 to MC-5 for the bituminous portion of the mix and aggregate to meet the following gradation:

Sieve Size	Per Cent Passing
1-inch	100
¾-inch	95-100
⅜-inch	65-85
No. 4	50-65
No. 16	30-43
No. 50	16-25
No. 200	3-8

For this surfacing, the mixing procedure is similar to that for any asphaltic-concrete pavement. Aggregates must be dried to a moisture content of less than 1 per cent and screened into three sizes, stored in separate bins, and accurately proportioned by weight into a pugmill-type mixer to produce the specified grading in the combination. Liquid asphalt is added at rates of from 3 to 7 per cent as directed by the engineer. Mixing is done at temperatures between 225 and 275 degrees and continued for a minimum of 30 seconds after all the constituent parts are in the mixer.

Monterey County is fortunate in having a commercial plant conveniently located, from which it can purchase mixed material, delivered on the road within a radius of 20 miles, for an economical price.

After its delivery to the road, the material is spread by motor graders and rolled by county-owned steel-wheel and pneumatic rollers. Thicknesses of 1½ to 2½ inches are used for this type of surfacing, depending on the condition of the existing base and the anticipated traffic.

"Fuel-Oil" Mix

The fourth type of surfacing mentioned as coming into more general use in Monterey County is locally known as "fuel-oil" mix, but under wartime conditions MC-3 was used for the cementing and stabilizing agent. If sufficient thickness of gravel and base is in place on a section of road where the surface is to be improved, the base is robbed, by light scarifying and blading, to provide the mineral aggregate. In other locations the aggregate is purchased from commercial plants, produced and stockpiled under competitive-bid contracts or produced by county forces.

Enough aggregate is windrowed to provide material for a 1½-inch compacted thickness of surfacing. This material is spread into an 8-foot-wide flattened windrow along one side of the road, leaving the other side clear for essential traffic, and 0.45 gallon

(*Continued on next page*)

PARSONS *Wheel* TRENCHLINER

Improved wheel bottom support insures accurate grading, maximum production

TWO double-wheeled dollies, not one, support the bottom of the digging wheel, the section where digging pressure is greatest. Double support prevents wheel distortion, insures accurate grading, maximum production.

NEW CATALOG JUST OUT!

Performance:

Digging Depth: 5' 6" maximum.

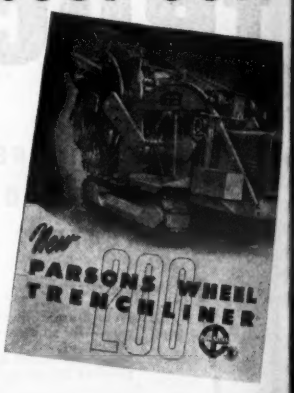
Digging Widths:
Buckets only: 15" 18" 21"
With Sidecutters 20" 23" 26"

Digging Speeds: 25, from 2.5" to 118" per minute.

Travel Speeds: 5, from ½ to 2.7 miles per hour.

Wheel Speeds: 5, from 36 to to 266 feet per minute.

Power: Choice of gasoline or Diesel.



OTHER MODERN PARSONS TRENCHLINERS

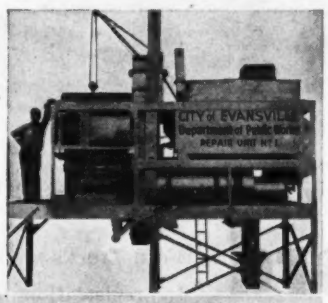
Model 250 Trenchliner (Ladder Type)
Depth: 12'
Widths: 16" to 42"

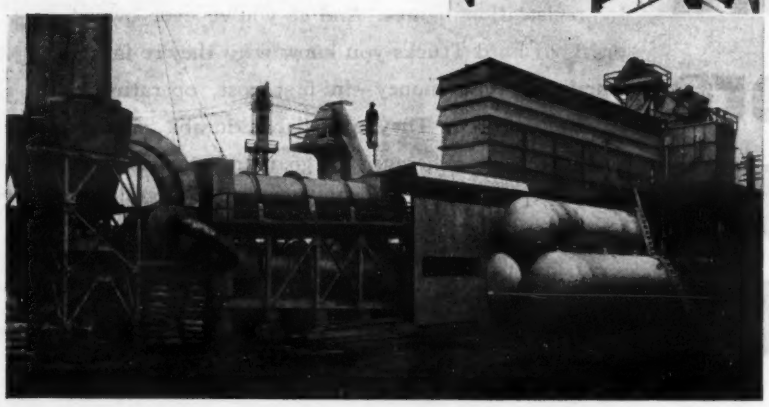
Model 310 Trenchliner (Ladder Type)
Depth: 15'
Widths: 18" to 54"

THE PARSONS COMPANY
KOEHRING SUBSIDIARY **NEWTON, IOWA**

TRENCHING EQUIPMENT

From the smallest portable patch plants to the largest stationary models





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Dependable performance—under a wide variety of operating conditions—is engineered and built into every Hetherington & Berner Asphalt Plant. As America's first builders of bituminous mixing machinery, Hetherington & Berner take pride in building equipment that will do a good job and prove a profitable investment for its owner. Every H. & B. plant is completely erected and checked at our factory before shipment.

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FOR BEST RESULTS — BATCH MIX • HOT MIX

Bituminous Surfacing On Plant-Mixed Base

(*Continued from preceding page*)

quid asphalt per square yard of finished mat is applied by a county distributor equipped with an 8-foot spray bar. This application is thoroughly blade-mixed by either pull blades or motor graders and then re-spread into an 8-foot wide windrow for the second application of asphalt at a rate of 0.40 gallon. Blade mixing is continued until uniformity is obtained, after which the windrow is again flattened and shot with a third application of asphalt at the rate of 0.40 gallon per square yard, and the final mixing and spreading are done by the same graders. This gives a total application of 1.25 gallons per square yard for the finished mat which is compacted to a thickness of 1½ inches by the combined use of pneumatic and steel-wheel rollers.

Bituminous surfacing, of whatever one of the four types currently used, is placed with mat widths up to 22 feet on the heavily traveled county roads, but is progressively narrowed on roads where travel is less intensive to a minimum of 14 feet on some of the little-used mountain roads in the southern part of the county.

Maintenance

Maintenance work is so organized in Monterey County that each District Road Superintendent with his crew of from seven to twelve men, of whom seven are usually continuously employed, handles all maintenance, other than bridge work, in his district. His equipment is kept at a conveniently located storage yard, with the central shop at Salinas available for other than minor repairs.

Each of the five District Superintendents has one or two RD4 Caterpillar tractors, or other makes of similar capacities, a pull grader, a bulldozer, and a shop-built front-end loader which is readily interchangeable with the bulldozer. He also has two Caterpillar motor graders and four steel-body Dodge or Chevrolet dump trucks of 1½-ton capacity.

For general use, to be switched from district to district as the work demands, Monterey County owns a Caterpillar RD8 tractor with a bulldozer and a 12-cubic-yard LeTourneau scraper, an RD7 tractor with an 8-cubic-yard LeTourneau, and a ½-cubic-yard P&H machine with dragline and clamshell buckets and a shovel attachment. A second machine of this type has been ordered and the County hopes for early delivery, since it has been found most useful for digging drainage ditches, excavating for new drainage structures, loading trucks, placing bank-protection structures, and work of a similar nature.

For efficient transportation of this special equipment, the County utilizes a trailer which is successfully handled by the light trucks except on some of the mountain roads, one in particular having a 15 per cent grade for 7 miles, where the motor graders are used to pull the trailer.

The two county distributors are also available for use where needed, with necessary booster trucks for feeding them if asphalt is hauled from the central yard at Salinas as is done in the northern districts. In the southern part of the county, asphalt is usually trucked directly from the refinery located at Santa Maria, 75 miles to the south.

Holes in asphalt-surfaced roads are patched by hand crews, using material which has previously been blade-mixed and stockpiled in conveniently located areas. MC-3 is used in the mix for stockpiling, and an asphalt emulsion applied as a tack coat. In areas near the plant, pre-mixed material meeting the specifications for "Plant-Mixed Surfacing" is sometimes used for patching, and a recently completed small asphalt mixing plant in the Salinas yard is now being used to prepare and stockpile patching material.

Storage for liquid asphalt is available at the Salinas yard in two 12,000-gallon underground tanks and one 17,000-gallon overhead tank, both fed from tank cars spotted on the adjacent Southern Pacific Railroad siding by two 3 x 5-inch and one 2½ x 3-inch duplex steam pump operated from a 40-hp horizontal boiler.

With this equipment already installed, it was considered advisable to erect a small asphalt mixing plant at the yard to pre-mix and stockpile material for patching. A small drier, 42 inches in diameter and 22 feet long, was erected and is driven, with the hot elevator, by a steam engine getting its power from the same boiler used to heat the asphalt and atomize the fuel oil used in the drier. The latter is fed by a clamshell bucket on the yard crane, but the dried material is carried by a bucket elevator to a small 2-cubic-yard steel bin erected over the 2,000-pound pugmill, which is set high enough to permit gravity discharge into dump trucks driven under it.

(*Concluded on next page, Col. 3*)

WINPOWER ELECTRIC PLANTS

NEW POST-WAR MODELS

350 to 35,000 watts A.C. and D.C.

Light, Safe and Portable
Sturdy and Compact in Construction
Modern in Design and Inexpensive to Operate

These models have extremely high output for their size and weight. They are recommended for portable work on road and construction jobs, repair depts., fire depts.; indispensable for lighting and operating of electric tools such as portable compressors, drills, saws, sanders, etc.

Immediate shipment from emergency stock on many models. Wire us your requirements.

WINPOWER MFG. CO., NEWTON, IOWA

ON THE HIGHWAY

it's Bethlehem All the Way

REINFORCING STEEL—Bethlehem Reinforcing Bars, plain and deformed, are made in all standard sizes and grades, of new-billet steel. Most Bethlehem warehouses can bend bars to shape and cut them to specified lengths.

Bethlehem Welded Wire Fabric conforms with A.S.T.M. specification A-185-37, and is readily installed and gives reliable service. Made to meet all standard specifications.

GUARDS AND POSTS—Standard Bethlehem ¾-in., 3-strand highway guard is made of tough, durable, double-galvanized Bethlehem steel cable. Bethlehem's beam-type guard rail, called the Safety-Beam, (shown above) is made in standard lengths of 12 ft., 6 in.—or can be supplied in lengths up to 50 ft.

Properly-driven, Bethlehem Steel Highway Guard Posts have a resistance to impact or side-thrust equal or superior to that of wood posts. The Bethlehem Highway Guard Bracket, made of high-tension spring steel, can be economically applied to guard posts of either steel or wood, even if already standing.

WIRE ROPE—Bethlehem Wire Rope is made in a full line of sizes, and fills needs of highway builders for crane, shovel, dragline, haulage and other kinds of rope. Bethlehem's top-quality rope is its "Form-Set" (preformed) in the tough, strong Purple Strand grade.

Where highway steel products are concerned, Bethlehem will go along with you, all the way down the line. For Bethlehem makes every one of the steel items needed to build a modern concrete highway, and any kind of highway bridge.

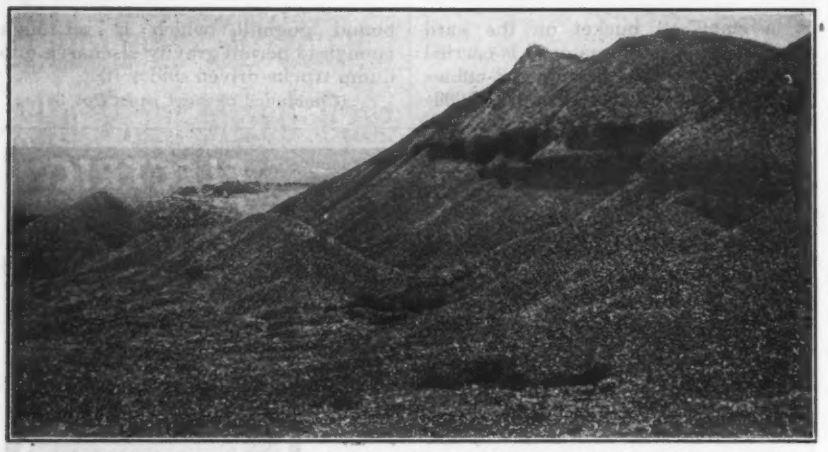
Let Bethlehem help you avoid confusion, delay and extra paperwork in obtaining road steel for your highway jobs. When you put the supplying of all the steel for a highway project up to Bethlehem, the order is handled as a unit. Shipments from Bethlehem's strategically-located warehouses are arranged to suit your work schedules. You receive the steel when and as you need it.

The nearest Bethlehem district office—or Bethlehem's general offices at Bethlehem, Pa.—will gladly explain how Bethlehem's co-ordinated highway-steel service can save time and money for you.

BETHLEHEM PRODUCTS FOR HIGHWAYS

Road Joints • Center Strip • Dowels • Dowel Bar Supports • Reinforcing Bars • Bar Mats • Bar Ties • Reinforcing for Concrete Pipe • Bridge Floor Reinforcing • Concrete Slab Spacers • Welded Wire Fabric • Guard Rails • Guard Posts and Brackets • Wire Rope and Strand • Right-of-Way Fence and Posts • Anchor Rods • Pipe • Hollow Drill Steel • Digging Bars Structural Steel • Mold Boards • Corrugated Sheets • Turnbuckles • Tie Rods, Spikes, Bolts and Nuts • Timber Bridge Hardware Sheet and H-Bearing Piling

★ BETHLEHEM STEEL ★



Over 3,000,000 tons of shell stone has been removed and crushed since discovery of deposits at Belgrade, N. C., about four years ago. This material, in a stratum at least 20 miles long and 20 feet thick, is used for highway and runway construction.

Kentucky Reverses Toll-Bridge Trend

With the increase in proposed toll bridges to be built by states and counties on our highway systems, it is heartening to have Kentucky free eight of its twelve toll bridges on August 25, 1945. According to J. S. Watkins, State Highway Commissioner of Kentucky, collections at the bridges had become sufficient to permit free traffic over the eight spans five years earlier than anticipated. These bridges were constructed by the Department of Highways in 1930-32 and were financed through the sale of $5,101,000 in revenue bonds.

The bridges which have been freed include Eggner's Ferry Bridge and the Paducah Bridge over the Tennessee River, the Smithland, Burnside, and Canton Bridges over the Cumberland River, the Tyrone and Boonesboro Bridges over the Kentucky River, and the Spottsville Bridge over the Green River.

An extensive celebration was staged at several of the bridges, with the principal ceremony at Eggner's Ferry Bridge and subsidiary ceremonies at the Burnside, Spottsville, Tyrone, and Boonesboro Bridges.

Kee Joins Consultants

Clark M. Kee, Assoc. M., Am. Soc. C. E., for twelve years Airway Engineer for American Airlines, has joined the firm of Airways Engineering Consultants, Inc., 1621 Connecticut Ave., Washington 9, D. C. Prior to his association with American Airlines, Mr. Kee was engaged in airway and airline construction and operation in Mexico, Cuba, Costa Rica, and other Central and South American countries.

Bituminous Surfacing On Plant-Mixed Base

(*Continued from preceding page*)

For this pre-mixed patching material, the County mixes 8 to 8½ per cent of MC-3 liquid asphalt with sand at a temperature (about 225 degrees) only sufficiently high to eliminate the contained moisture but not high enough to drive off the volatile constituents of the liquid asphalt. By mixing at this low temperature, a patching material is obtained which retains its workability until used. The sand for this pre-mixed patching material has the following grading:

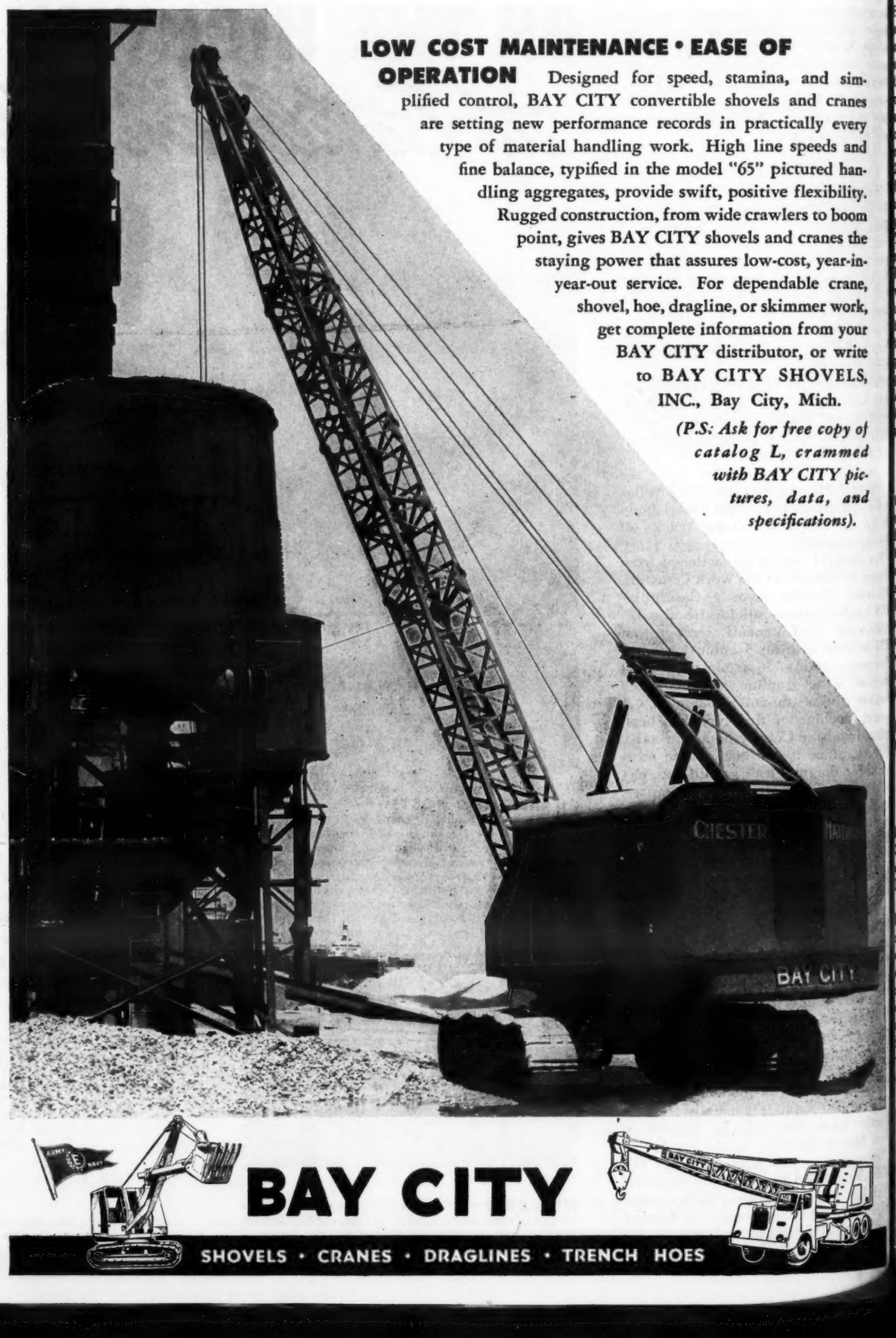
Sieve Size	Per Cent Passing
No. 4	90-100
No. 8	.....
No. 16	46-67
No. 50	22-33
No. 100	.....
No. 200	6-14

When extensive re-sealing jobs are performed in any district, two power brooms are available for cleaning the road surface. The distributors and booster tanks are transferred temporarily from the Salinas yard.

Little mowing is done at any time in Monterey County but the shoulders of all county roads are bladed periodically to kill the encroaching weeds.

Center-stripe painting has been greatly curtailed during the war but a certain amount considered essential is still performed, using California Division of Highways standard traffic-line white lacquer. This paint is applied by a California-model striping machine pushed ahead of a truck, with a Schramm 120-cubic-foot compressor pulled behind to furnish the required air pressure. A stripe 4 inches wide is applied, with a 30-foot gap between 10-foot painted sections.

Chinese who helped build bases for the B-29's in China developed their own name for the jeep, according to "News of China". Their written characters, translated literally, designate the jeep as "four wheels with 1,000 uses".



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CATAPHOTE CORPORATION
Toledo, Ohio

Small Skew Bridge, Material Handling

Continuous-Beam Structure Has Two Piers With Five Footings Each on Solid Rock; Truck-Mixed Concrete

A SMALL reinforced-concrete bridge with nine continuous girders on a 45-degree skew was completed by the Bowers Construction Co. of Raleigh, N. C., this past spring. Spanning the Virginia Electric Power Co. Canal on the new Fredericksburg, Va., By-Pass, it is one of three structures in the contract. The work on this bridge of two 55-foot and one 55-foot span was started February 26, 1945, and despite bad spring as concerned weather and the man-power situation it was completed on time.

The bridge is designed to carry an H-20 loading on its 56-foot clear roadway, and has two 4-foot sidewalks. The structure runs approximately north and south with abutment A and pier 1 as the southerly units and pier 2 and abutment B to the north. The contractor started by driving the sheeting for the cofferdam for pier 2. The cofferdam measured about 10 x 90 feet, allowing 2-foot clearance all around for the forms, and the steel sheet piling was driven through 3 feet of muck to hard granite-shale in the 12-foot-deep canal. The driving was done by a drop hammer with swinging leads handled by a Koehring 303 crane. The same crane with a ¾-yard clamshell bucket was used to excavate under the water, and then the cofferdam was unwatered by two 2-inch and one 4-inch Rex self-priming pump and one 4-inch diaphragm. The bottom was hand-cleaned. A solid foundation was hit 3 feet above the elevation shown in the plans which saved considerable excavation.

Concreting

All of the concrete for the substructure was mixed and hauled in truck-mixers owned by the contractor from his batching plant about a mile from the Vepco Canal Bridge, but located centrally to the three bridges in the subcontract. The aggregates were delivered a 5-mile haul by the gravel company supplying the material and stockpiled. A Bucyrus-Erie 10-B crane with a ½-yard clamshell bucket loaded the material to the Blaw-Knox batching plant.

The two 2-yard Smith truck-mixers handled a 6-bag batch proportioned as follows:

Gravel, ¼-inch and smaller	720 lbs.
Gravel, 1 to ¼-inch	1,080 lbs.
Sand	1,920 lbs.
Cement	6 bags*

The concrete was mixed for a 2 to 5-inch slump and produced a strength of 3,000 pounds in seven days. All of the concrete was vibrated in place by a Mall portable unit.

Five 6½ x 6½-foot footings 3 feet high carry the piers which are 2½ feet square and average 12 feet high. Concrete for the footings was delivered direct by a 1-yard bottom-dump bucket swung by the Koehring crane. For the columns the same bucket was used with an elephant-trunk chute. The column forms were built of 1 x 8-inch planks with 2 x 6 wales. The column ties were attached to the wales at each side.

The two abutments are each supported by forty creosoted piles driven by the same 2,400-pound drop hammer used for the footing piles. These piles are carried 15 inches into the abutment and were driven in groups of three at the girders, with two vertical and one battered towards the canal side. In addition, there is a single pile in the abutment between each two of the nine girders.

The falsework for the deck forms consisted of two pairs of piles on each side of each column, on which were 12 x 12-inch caps to carry 2 x 8-inch dressed sheeting with 2 x 6-inch wales tied by Richmond Tyscrus. Forms for the concrete beams consisted of 1 x 8-inch dressed sheeting with 2 x 6-inch sills on the bottom supported by an I-beam on a 12 x 12 cap carried on four rows of piles. Richmond Tyscrus were used for holding the side forms rigidly in place.

For pouring the concrete deck, the contractor used a Koehring 27-E paver with a 6-bag batch and two 2-batch trucks to serve it. A single central runway was set over the bridge with three stubs for pouring along the outside. Three concrete carts carried a single cubic-yard mixed batch, and all concrete was vibrated in place. The largest concrete pour on this structure was 130 yards for the deck which was poured in a little over 5 hours. The next largest pour was 120 yards which was finished in 4 hours and 40 minutes.

All of the concrete was cured with Kuraseal A curing compound.

The labor organization used on this structure by the contractor consisted of 14 carpenters and helpers, 2 equipment operators, and 5 laborers.

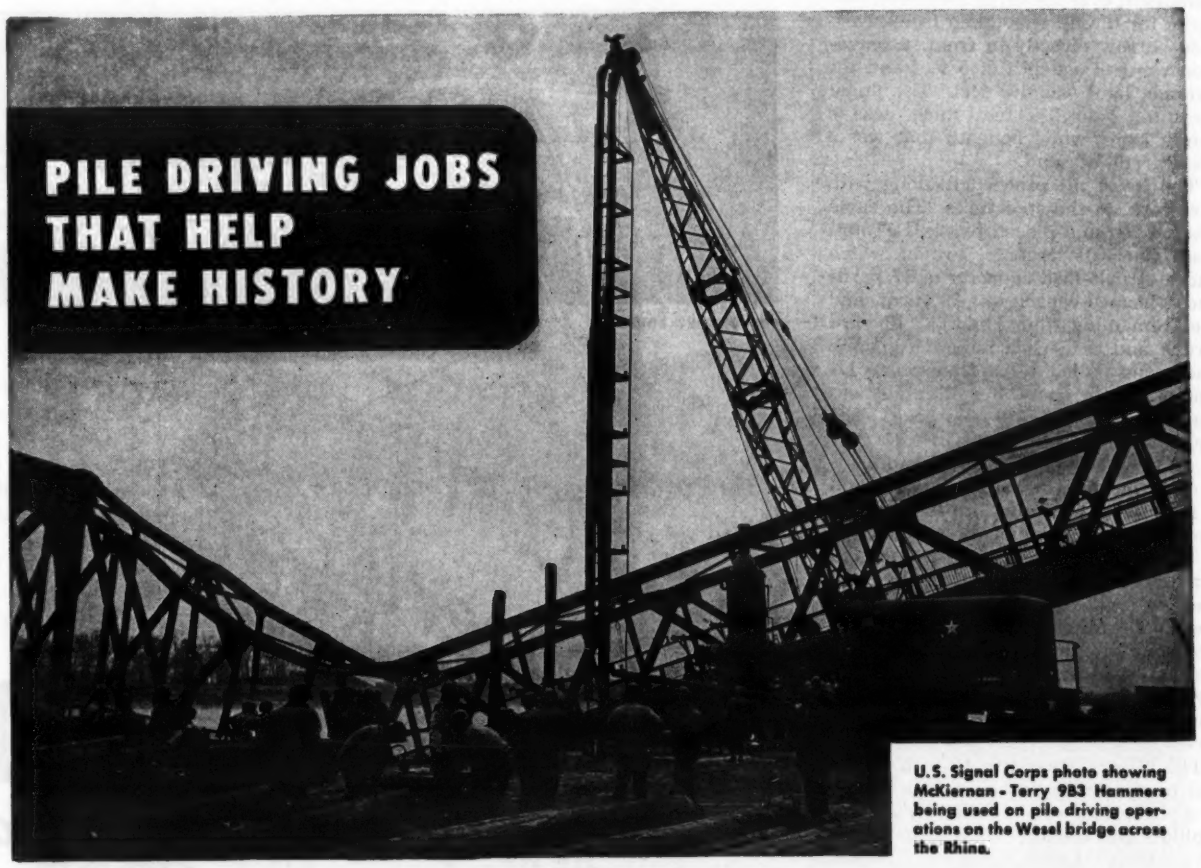
Estimated Quantities

	Concrete Cubic Yards	Reinf. Steel Pounds	Creosoted Piles-Feet	Excavated Cubic Yards
Superstructure	409.2	90,450	——	——
Abutment A	61.5	2,550	680	125
Pier 1	81.8	10,310	——	143
Pier 2	81.8	10,310	——	173
Abutment B	61.5	2,550	680	125
Total	695.8	116,170	1,360	566

Quantities and Personnel

The estimated quantities on which the contractor's bid of $43,178.15 was based are given in the accompanying table.

The Virginia Department of Highways awarded the contract for the construction of the Fredericksburg By-Pass, including the several structures, to the E. W. Hechler Co., Highland Springs, Va., which sublet the structures to the Bowers Construction Co. of Raleigh, N. C. The Vepco Canal Bridge described above, together with the other structures on this project, was designed by W. R. Glidden, Bridge Engineer of the Department, and built under the direction of C. W. Staggs, Resident Engineer, with C. E. Birch as Chief Inspector. R. E. Leach was Superintendent for the contractor on this structure. General J. A. Anderson is Commissioner, and C. S. Mullen, Chief Engineer of the Virginia Department of Highways.



U.S. Signal Corps photo showing McKiernan-Terry 9B3 Hammers being used on pile driving operations on the Wesel bridge across the Rhine.

When the most advanced front line troop detachments land on beachheads, capture ports or cross rivers in this global War, the first work to be done is to construct or reconstruct these facilities.

Large numbers of McKiernan-Terry Pile Hammers have been used in this work which is of gravest importance. In every theatre of the War they have been essential equipment for U. S. Engineers, Navy Department and Seabees.

Two essential requirements have had to be met in these vital tasks: *PERFECT PERFORMANCE* under the most arduous conditions, and *PROMPT DELIVERIES* under the most exacting schedules.

The large, modern, well-equipped McKiernan-Terry plants at Dover and Harrison, N. J., have produced the required hammers in ever-increasing quantities. The dependability of these machines has been thoroughly demonstrated in every war-time task to which they have been assigned, as well as in hundreds of important prewar projects all over the world.

The same manufacturing facilities and designs that have enabled McKiernan-Terry Pile Hammers to make these records will be available after the War to produce the best, not only in Pile Hammers, but in other products as well . . . Marine Equipment, Hoisting Equipment and Special Machinery, of which much has been and is being furnished to the Navy Department and Maritime Commission during the War. These facilities will help speed peacetime construction jobs and other activities in the Marine Field.

McKiernan-Terry
9B3 Double-Acting Pile Hammer

McKiernan-Terry CORPORATION

19 PARK ROW NEW YORK 7, N. Y.

Triple Drainage Pipe Through New Levee

(*Continued from page* 1)

from overflow when high river stages occur. The reservoir area in the creek and Kidd Lake is sufficient to hold local surface water during times when the flood gates are closed.

Building the Levee

The old levee had a life of forty years from its construction shortly after the record flood of 1903. Borrow for rebuilding the section over the small drainage structure came from the land side of the levee, since the ground on the river side is too low and also heavily timbered. The material excavated was a rich black soil known as gumbo, which becomes soapy or sticky when wet, and was taken out to a depth of 1½ feet and hauled an average of 600 feet to the old levee. For the new embankment over the large structure, material for the fill was taken from riverside borrow directly in front. Excavation went to a depth of 5 feet and the average haul was 300 feet. The upper stratum, 2 to 2½ feet thick, was a sandy loam, while beneath that was a good grade of sand.

The levee fill proceeded along with the work on the structures. The earth was moved and placed by six LeTourneau Carryall scrapers, two of which had a struck-load capacity of 17 yards and a heaped capacity of 23 yards, and the remaining four had a 12-yard struck and a 15-yard heaped capacity. Each was pulled by a Caterpillar D8 tractor, while one Caterpillar D7 was used as a pusher to help load. The tractors traveled in fourth or fifth gear at an average speed of 4 to 5 mph.

An inspection ditch, 7 feet wide and 6 feet deep, was dug in the ground along the center line of the new section of levee to detect the presence of old drains or tree trunks that might form lines of seepage through the embankment. The ditch was excavated by a Koehring dragline with a 45-foot boom and a 1-yard bucket, a piece of equipment that was put to a variety of uses during the work on the drainage structure.

The fill was spread in 12-inch layers and compacted by at least four passes of a sheepsfoot roller pulled by a Caterpillar D8 tractor. Two Caterpillar D8's with LeTourneau bulldozers trimmed and dressed the fill by running along the slopes when they were dry enough to prevent sliding. When the slopes were wet from rain or thaws, the tractors worked down the slopes perpendicular to the crown, always pushing the surplus earth down instead of up, thereby getting a smoother levee slope. The new section of levee was built up to a gross grade of 402.5 to allow for a shrinkage of 1 foot to a net grade of 401.5. It has a 40-foot berm at the natural ground level, beyond which borrow was taken on a 1 on 3 slope.

An average of 3,500 yards of embankment was placed during a 9-hour day whenever operations on the structures did not interfere with the earth-moving. One tractor with dozer could dress about 500 feet of levee slope in a day. A crew of fourteen worked on the earth-moving, consisting of a superintendent, eight tractor operators, two oilers, a mechanic, a dragline operator, and a helper. Seeding of the slopes was done in the spring.

Triple 72-Inch Structure

Excavation of the trench for the three 8-gage asphalt-coated galvanized corrugated-iron pipes, each 250½ feet long, was done by the Koehring dragline, which also opened up the inlet and outlet ditches and lowered the 22-foot, 2½-inch lengths of pipe into the trench. The pipe lengths at the head wall were slightly shorter in order to meet the overall specified length of structure. A 4-inch Sterling pump was used to keep the trench dry. The Armco pipe was shipped by freight from the plant in Ashland, Ky., to the town of Prairie du Rocher, Ill., and hauled the remaining 2½ miles to the job site by truck.

In order to prevent lines of seepage forming alongside the pipes, causing erosion and possible undermining of the fill, nine diaphragms were placed around each pipe starting 33 feet 3 inches from the head wall, and continuing at a spacing of 20 feet 2 inches towards the land side of the levee. They were made from 12-gage galvanized corrugated iron, and are lighter than the pipe for flexibility. The diaphragms came in two sections with the lower half set first to receive the pipe. After the pipe was lowered in place, the upper half of the diaphragm was secured with bolts through slotted holes, forming a section 13 feet square chamfered at the corners to reduce weight.

The lengths of pipe were butted together and secured with a 12-gage 24-inch galvanized corrugated-iron coupling band which lapped 12 inches on each pipe. These bands were slipped on by hand and fastened firmly in place with hoops and lugs. The diaphragms were fastened to the pipe in similar fashion. A camber of 6 inches was put in the grade of the pipe under the center of the levee so that when the fill settled the straight pitch of 6 inches between the inlet and the outlet would be retained.

Pipe Deformed Under Fill

Prior to placing the backfill, the 72-inch culvert pipes were deformed by elongating them up to about 5 per cent along the vertical diameter, giving the

(*Continued on next page*)

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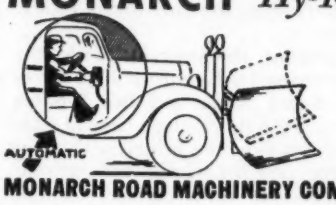

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NEW DODGE *Job-Rated* TRUCKS

LISTEN TO THE MUSIC OF ANDRE KOSTELANETZ WITH GUEST STARS, THURSDAYS, CBS, 9 P. M., E.T.

Because of the dependable and economical service received from Dodge trucks throughout the war, more and more construction firms are placing orders for early deliveries of new Dodge Job-Rated trucks.

Triple Drainage Pipe Through New Levee

(*Continued from preceding page*)

pe an egg-shaped section. Tie rods, ced 2 feet center to center, were laced across the horizontal axis of the pe and fastened on the outside with ts bolted to 2 x 2 x 3/16-inch angles. 4-inch turnbuckle at the center per- tted adjustments. At the extremities the pipe the deformation was zero, d was gradually increased in relation the height of the fill until the vertical is of the pipe, under the center of e fill, was elongated to 75⅝ inches.

As the backfilling took place, the rnbuckles were loosened gradually til only about 2 per cent of elonga- ion was left as the last layer of fill was laced and compacted. When the fill ad been fully compacted, the rods ere removed and aluminum plugs ere hammered in to fill the holes made y the rods.

Backfilling over the pipe had to be one before the head wall was poured o that the ends of the pipe were free to move as the levee section was built up. The backfill was placed in 12-inch loose layers by the dragline, wet down with a hose, and carefully hand tamped around the bottom, sides, and top of the pipe to a height of 10 feet 6 inches above the bottom of the trench. The rest of the fill above that was compacted as regular levee fill.

The joints of the pipe were caulked on the inside with asphaltic cement which was melted by a Hauck kerosene torch so that the material completely filled the spaces between the sections of pipe, sealing the joint for its full circumference.

Head-Wall Foundations

Foundation excavation for the river-side head wall was done by the dragline, after which 34 round and untreated-timber piles, 12 inches at the butt and 6 inches at the tip, were driven as a foundation. The dragline was fitted with 27-foot leads and a 2,700-pound cast-steel hammer, which was dropped 22 feet. The piles, averaging 26 feet long, were driven 25 feet into the ground and cut off 6 inches above the bottom of the footing.

The contractor was given a choice of constructing either a concrete toe wall, 5 feet deep x 3 feet wide x 42 feet 2¾ inches long, along the outside of the footing, or driving a row of interlocking corrugated-steel piling in the same location. Because of the very low ground and the moisture in the sand, concreting at this depth would require a cofferdam or a wellpoint system so the contractor chose to drive the sheet piling. A hammer swung by the dragline drove 16-inch sections of piling 5½ feet deep along the edge of the foundation, leaving 6 inches of the piling protruding to be imbedded later in the 21-inch-thick reinforced-concrete foundation slab.

No. 12-gage black corrugated-steel sheet piling of the full interlocking type was also driven to form a cut-off wall for a concrete sill at the land-side end of the pipe. The piling was driven across the 31½ feet of trench to a depth of 5 feet, leaving 6 inches projecting into the concrete sill which is 1 foot deep and 1 foot 4 inches wide.

U. S. E. D. Photo

The triple 72-inch-diameter drainage pipe in the levee near Fort Chartres, Ill., was installed with diaphragms every 20 feet, to prevent the formation of lines of seepage along the pipe.

Similar piling was also driven to a depth of 3½ feet along the 42-foot 2¾-inch outside edge of the concrete apron which adjoins the river-side head-wall footing. In this instance the contractor also decided to use piling instead of a concrete toe wall 3 feet deep x 9 inches wide.

Cold-Weather Concreting

The pouring of concrete was done through the winter so precautions had to be taken to keep the pour from freezing. The sand was purchased from the Missouri-Illinois Sand Co. at East St. Louis, and shipped 50 miles in railroad cars to Prairie du Rocher where it was loaded into hired trucks by a crew of the contractor's laborers using hand shovels, and hauled 2½ miles to the site of the drainage structure where it was dumped in a stockpile. Stone for coarse aggregate came from the nearby Columbia quarry where it was crushed and graded to specifications and hauled 2 miles to the job in hired trucks. Bag cement was purchased from the Mis-

(*Continued on next page*)

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- Spreads thick or thin as desired
- Attaches to truck as a tailgate
- Does not limit use of truck
- Clutch controlled from cab
- Starts spread with truck in motion
- Stops spread with truck in motion
- Self feeding—no helper on back
- Spreads forward or backward
- Half or full width of street
- Reduces number trucks required
- Positive uniform spread
- Fits any dump truck
- Thousands in use

USE FEWER - MEN - TRUCKS - TIME

New simplified construction, installation and maintenance, new ease of operation . . . but basically the same practical economical efficient Flink spreader that has proved itself in a thousand tough road construction and maintenance jobs . . . in ice control and dust control all over America. Write for complete information.

THE FLINK COMPANY

DEPT. 4 STREATOR, ILLINOIS

Triple Drainage Pipe Through New Levee

(*Continued from preceding page*)

souri Portland Cement Co. at Cape Girardeau, Mo., and shipped 100 miles in freight cars over the Cotton Belt Railroad to Prairie du Rocher where it was transferred to local hired trucks, hauled to the job site, and stored under tarpaulins.

The grading of the aggregate was as follows:

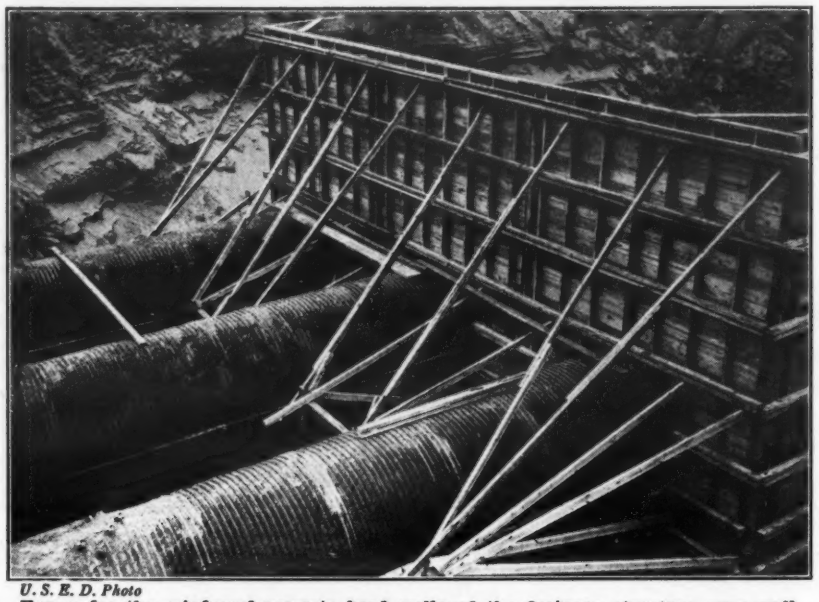
Total Passing	Per Cent by Weight	
	Sand	Stone
1-inch sq. mesh screen	....	97-100
½-inch sq. mesh screen	....	40-70
No. 4 sieve	95-100	0-6
No. 16 sieve	45-75	....
No. 50 sieve	10-25	....
No. 100 sieve	2-8	....

The day before concrete was poured, a trench was dug through the middle of the stockpile of sand, and a 25-foot length of the 3-foot-diameter metal drain pipe used in the old structure was set in place and covered with the sand. A 3-foot length of elbow pipe was stuck on one end to provide a draft, while a coal and wood fire was built in the other end of the pipe. When it was burning well, the fire was pushed with sticks to the center of the pipe. This fire was maintained all night so that by morning, when concreting began, the stockpile of sand was thoroughly warmed.

Water was heated in a semi-cylindrical iron trough, 9 feet long x 3 feet in diameter, which had once been part of a threshing-machine tank. The trough rested on concrete blocks and was heated from beneath by a coal and wood fire. The top of the trough was covered, but a circular 12-inch opening was left to admit water which was pumped from a sump in the nearby creek by a Jaeger 2-inch pump. Another small Jaeger pump drew the water through a 1-inch pipe line running from the bottom of the trough to the tank on a Jaeger 10-cubic-foot concrete mixer driven by a Waukesha engine. The torch of a Hauck 20-gallon portable kerosene heater was mounted on the drum of the mixer and used to heat the concrete during mixing. The stone was not heated prior to mixing.

Form Work and Pouring

The forms for the entire structure were of wood, cutting being done by a



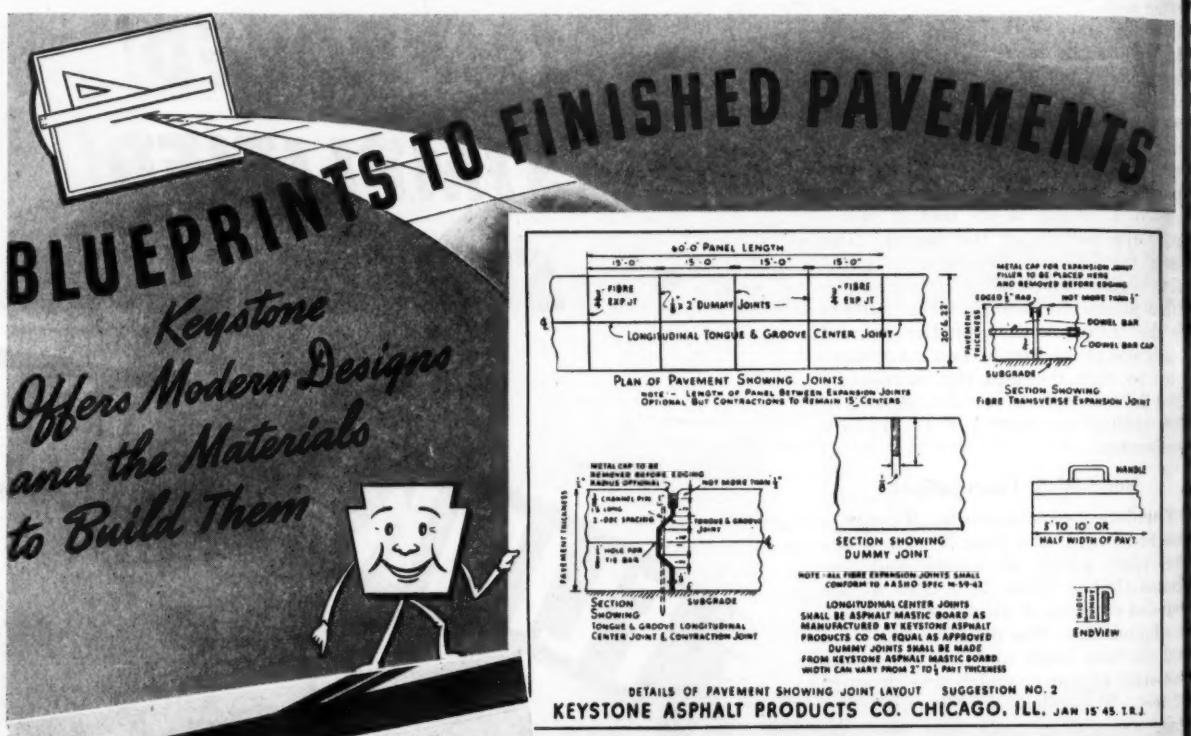
U. S. E. D. Photo

Forms for the reinforced-concrete head walls of the drainage structure were well braced for stability during the pour.

Beach 12-inch circular-blade saw driven by a Wisconsin engine. Forms for the foundation and the apron were made from 1 x 8-inch boards of assorted lengths, strongly braced with 2 x 4's anchored in the ground and backed with mounds of earth. The wall forms were also built from 1 x 8-inch boards backed by 2 x 4 studs, spaced about 2 feet, which were held in place with double 2 x 4 wales, spaced at 2½ feet. Additional bracing was supplied by long 2 x 4 sections at 6-foot intervals, anchored in the ground at one end and supporting the top of the wall at the other. Rods ¼ inch in diameter were used for form ties, and were well greased to facilitate their removal from the concrete.

The 21-inch reinforced foundation was poured first, after which the final lengths of pipe leading into the head wall were set in place. Then the 6-inch reinforced apron, which measures 4 feet 2¾ inches x 20 feet, was poured next. The concrete was mixed 1¼ min-

(*Continued on next page*)


BLUEPRINTS TO FINISHED PAVEMENTS
Keystone
Offers Modern Designs
and the Materials
to Build Them
60'-0" PANEL LENGTH
15'-0"
FIBRE EXP JT
2" DUMMY JOINTS
LONGITUDINAL TONGUE & GROOVE CENTER JOINT
PLAN OF PAVEMENT SHOWING JOINTS
SECTION SHOWING DUMMY JOINT
SECTION SHOWING TONGUE & GROOVE LONGITUDINAL CENTER JOINT & CONTRACTION JOINT
SECTION SHOWING FIBRE TRANSVERSE EXPANSION JOINT
END VIEW
DETAILS OF PAVEMENT SHOWING JOINT LAYOUT SUGGESTION NO. 2
KEYSTONE ASPHALT PRODUCTS CO. CHICAGO, ILL. JAN 15 '45. T.R.J.

Designed, engineered, tested, and proved in actual use to meet the critical demands of forward-looking highway engineers and state highway specifications, Keystone paving products can be depended upon to do the job they were planned for in the most practical, up-to-date way. In the plan above Keystone Mastic Board Tongue and Groove Expansion Joint is used as center strip with Keystone Asphalt Dummy Joint for the contraction joint. Blueprints of this plan and other designs for modern pavements may be had on request.

To insure maximum load transmission in the runways of the new Civil Aeronautics Authority Boone County Airport, Covington, Kentucky, Keystone Tongue and Groove Joint is being installed. This rigid asphalt mastic board joint distributes the load without cracking.

Topping off the paving job with Kapco Concrete Curing Compound gives pavements more resistance to abrasion, helps retain their moisture longer and hold up under heavy traffic. The new Kapco—a membrane type curing compound, retains practically 95% of the moisture during the critical curing period. It's easy-to-apply, there's no mess or bother, and it does not discolor. Send for free sample.

KAP Keystone ASPHALT PRODUCTS CO. A DIVISION OF AMERICAN-MARIETTA
GENERAL OFFICES
43 E. OHIO STREET • CHICAGO 11, ILL. • MANUFACTURING PLANT: CHICAGO HEIGHTS, ILL.
A COMPLETE LINE OF MODERN "ENGINEER-APPROVED" CONCRETE PAVING PRODUCTS

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TARPAULINS
and WINDBREAKS

Protection when you need it can save many man hours on the job. FULTEX Waterproof Tarpaulins and Covers are well known and widely used. They have proven their quality through heavy duty and long wear. You get your money's worth when you buy FULTEX.

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Atlanta St. Louis Dallas Minneapolis
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riple Drainage Pipe Through New Levee

(*Continued from preceding page*)

in the following proportions:

Cement	94 lbs.
Sand	218 lbs.
Stone	332 lbs.
Water	45 lbs. or 5½ gals.

The sand and stone were weighed in heelbarrows on a Winslow Junior uble-beam scale on the way to the ixer. In the foundation and apron ours, the concrete was dumped in heelbarrows and then chuted into the rms, while for the walls and columns 1-yard concrete bucket swung by the agline was used. The concrete was brated by a Mall and a Jackson vi-rator.

The reinforced-concrete wall was oured in air temperatures around 25 egrees F, while the temperature of the eated concrete was between 40 and degrees F. The concrete was kept arm for at least 72 hours after pour-g by means of long tarpaulins reach-g to the ground under which eight lamanders were kept burning, three front, three in back, and one at each d. The salamanders were made from l drums with the bottoms and tops ocked off. Holes were driven with a k about 6 inches from the bottom the drum and three or four pipes shed through to form a crude grate. oke fires were made on the grate and good draft was obtained by putting a ne or two under the bottom of the um to permit the passage of air.

Sluice Gates

Before the 16-foot wall section was oured, the 72 x 72-inch sluice gates, anufactured by the R. Hardesty Co. Denver, Colo., were set in place by e dragline. Each gate and frame eighed 2½ tons and was supported on ncrete blocks until the entire unit as cast in concrete. The gates with justable side wedges are designed to thstand a maximum static hydraulic ad of 30 feet above the center line of e gate, and to operate satisfactorily der heads from 0 to 30 feet. The wall which they are set is 18 inches thick that point.

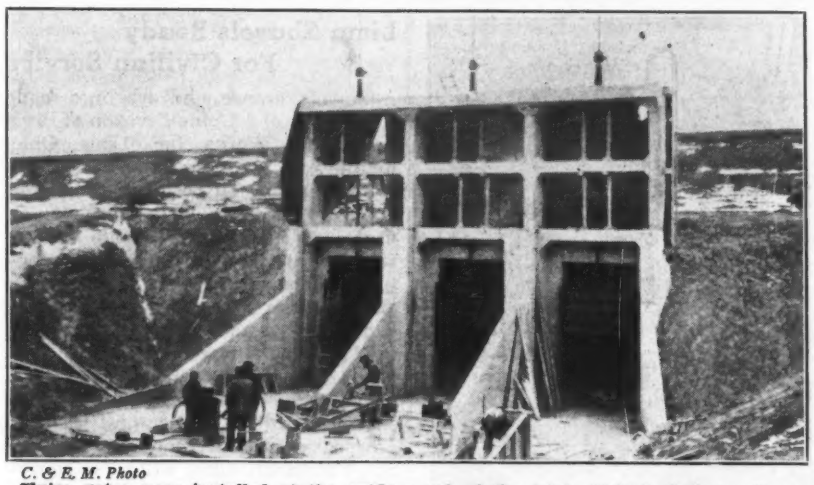
The upper platform, which holds the erating mechanism for the three tes, is 12 feet 9 inches above the top the main wall, giving a total height 28 feet 9 inches from the floor of the ucture. The three stems and hoists re set in place by the crane and their erations tested. The hoists for the tes are 2-speed enclosed heavy-duty its operated by a hand crank. One n can raise or lower the three gates four hours. The local levee district responsible for the operation of the tes and the removable crank handle entrusted to a nearby farmer. The tform is reached by a steel ladder at e side where there is also fastened a ge, 31 feet long, with its zero set to vation 370. Another similar gage is at the land side of the drainage ucture.

Slope Paving

The earth slopes at the inlet and outlet ditches of the drainage structure were paved with concrete blocks, 6 x 12 x 12 inches, of the same mix used in the structure itself. A total of 13,400 blocks was used on these 1 on 2 slopes. The wood forms for the blocks measured 15 feet 3 inches x 13 feet 1 inch, outside dimensions, with a depth of 6 inches. Eight such "beds" were made, the floors being formed of 1 x 12-inch boards, and the sides of 1 x 6-inch boards with grooves cut at 12-inch intervals to receive the 1-inch board separators, placed so that each "bed" had a capacity of 140 blocks at a single pour. The oiled separators were set in place before the pour and were well spaded so that they could be removed later with little effort. The "beds" were supported and built to a level grade by means of 2 x 4's placed at 2-foot spacing on the ground.

The blocks were placed on end, with staggered joints, on top of a 6-inch layer of crushed stone graded from ½ inch down to dust. The stone was bought at the nearby quarry, hauled to the top of the slope, and dumped there. Laborers with shovels and rakes pulled the material down the slopes to the masons, who laid the blocks from the bottom of the slope towards the top at the rate of eighteen blocks to the square yard.

(*Concluded on next page*)



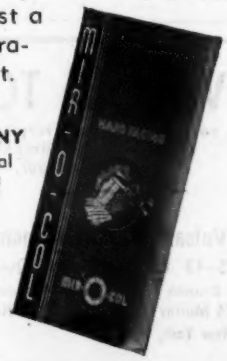
C. & E. M. Photo
Sluice gates were installed at the outflow end of the triple 72-inch drainage lines through the Fort Chartres levee.

The construction industry's meaning of "Duration" will always be a "length of life" measured in work-hour efficiency of equipment.

During war-time economy, operators—both combat and civilian—applied MIR-O-COL metals by welding methods to hard-face edges of scraper blades, bucket teeth and other wear points of construction apparatus. Because of the tough-hardness compounded in the metal rods, useful life of metal-to-earth contact parts increased many times. On battle and home fronts MIR-O-COL hard-facing stood as a protective film—resisting abrasion and impact—withstanding more operational abuse—saving countless hours of down time for maintenance and replacement.

Compounded in the foundry with skill born of long experience in combining metals, these rods are available through distributors in types and sizes required for application on all classes of equipment.

Operators producing on the competitive market of "tomorrow" will be able to use MIR-O-COL hard-facing to protect both the project and equipment "for the duration." Not just a "duration" of war, but a "duration of production" at a profit.



WRITE TO MIR-O-COL ALLOY COMPANY today. Learn more about the use of "Special Alloys for Production Purposes." A copy of "Weldor's Guide to Successful Hard-Facing" will be sent FREE at your request.

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For 68 Years Builders of Fine WHEEL BARROWS:
AMERICAN
STEEL SCRAPER CO.
Sidney, Ohio
Watch for Post-War Models

Triple Drainage Pipe Through New Levee

(*Continued from preceding page*)

Smaller Drainage Structure

The culvert pipe used in the other drainage structure is 111 feet long, 18 inches inside diameter, and made of 12-gage galvanized corrugated iron. It has two diaphragms 8 feet square and chamfered at the four corners. At the outlet end is a Calco gate hinged on top, built to withstand a maximum static hydraulic head of 10 feet above the center line of the gate.

A force of 25 men was employed on the construction of both these drainage structures.

Quantities and Personnel

The major quantities involved in this contract were:

Timber piling	850 lin. ft.
Steel sheet piling	158 sq. ft.
Concrete blocks	765 sq. yds.
Embankment	50,000 cu. yds.
Concrete	157 cu. yds.
Reinforcing steel	12,000 lbs.
Culvert pipe, 18-inch	111 lin. ft.
Culvert pipe, 72-inch	752 lin. ft.

This reconstruction of the levee and drainage structures on the Mississippi just below historic Fort Chartres was done under the direction of the St. Louis District, U. S. Engineer Department, of which Col. L. B. Feagin is District Engineer, Lt. Col. J. A. Adams is Deputy District Engineer, Lt. Col. E. H. Shutt is Executive Officer, and Lt. Col. W. F. Lawlor, Chief Engineer of the Engineering Division. Capt. L. F. Trost is Engineer in charge of flood control, with C. J. Weaver as his assistant. L. E. Dillow is Assistant Engineer on the earth work and drainage section. R. M. Neal was Resident Engineer and R. Guthrie was Inspector for the U. S. Engineers.

John Morse was Superintendent on the earth work and H. H. Reynolds was Superintendent on the structures for Joseph L. Pohl of Nevada, Mo., the contractor.

PMCO Dipper Catalog

The PMCO line of all-purpose dippers, featuring a manganese-steel front cast in one piece and wide-set corner-tooth construction permitting wider bite and increasing digging ability, is described and illustrated in a new 15-page catalog just received. Available in ½ to ¾-yard capacities, these sturdy lightweight dippers, equipped with reversible and renewable teeth, are reported to give 50 per cent increased production when used with old shovels and to offer 1-yard dipper performance on new shovels.

The catalog also includes data on the larger PMCO dippers, as well as all-purpose dragline buckets, pull-shovel dippers, and clamshell buckets, many of which are shown in on-the-job photographs working on a variety of projects.

Users of materials-handling equipment who wish copies of this new catalog "All-Purpose Dippers" should write to the Pettibone Mulliken Corp., 4700 West Division St., Chicago 51, Ill., and mention this review.

VULCAN TOOLS

A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

Vulcan Tool Manufacturing Co.

35-43 Liberty Street, Quincy, Mass.

Branch Offices and Warehouse Stocks:

74 Murray St. New York, N. Y. — 34 No. Clinton St. Chicago, Ill.

C. & E. M. Photo

Joints of the drainage pipe were sealed on the inside with asphaltic cement, melted by a Hauck torch.

Lima Shovels Ready For Civilian Service

Shovels, cranes, and draglines made by the Shovel & Crane Division of Lima Locomotive Works, Inc., Lima, Ohio, for the past 3½ years have been going to the military almost exclusively, but are now once more available to civilian users. Lima shovels are made in sizes ranging from ¾-yard to 5-yard capacity; crane capacities are 13 to 100 tons; and dragline capacities are variable, depending on the length of the boom used and the nature of the work.

Lima has just announced the appointment of five new distributors for its shovels, draglines, and cranes: Carroll-Edwards & Co., Richmond and McLean Sts., Cincinnati, Ohio, will serve southwestern Ohio, extreme eastern Indiana, and three counties in Kentucky; Construction Equipment Corp., 11-22 43rd Ave., Long Island City, N. Y., will handle southeastern New York, Long Island, and Staten Island; the Bill Goodwin Machinery Co., P. O. Box 2687, San Antonio, Texas, has the extreme southern Texas territory; Reid-Holcomb Co., 370 S. Illinois St., Indianapolis, Ind., has as its territory all of Indiana except a few counties in the southeastern and northwestern part of the state; and Southern Iron & Equipment Co., P. O. Box 2029, Atlanta, Ga., has the northwestern Georgia sales territory.

Robins and Hewitt Open Charleston, W. Va., Office

Robins Conveyors Inc., Passaic, N. J., and its affiliate, Hewitt Rubber Corp., Buffalo, N. Y., have opened a new office in the United Carbon Building in Charlestown, W. Va. R. U. Jackson, who has represented Robins in the territory for fifteen years, will be in charge, assisted by H. N. Kepler, formerly in the Robins Washington, D. C. office. Handling Hewitt sales will be Nelson J. Reinhold who recently joined the company after fourteen years with Cincinnati Rubber Co.

RECORD BREAKERS

IN GETTING MORE WORK DONE—FASTER, CHEAPER!

Thor

PAVING BREAKERS

No. 25 PAVING BREAKER

Super heavy duty—84 pound—extra powerful—for tough, rough going under all conditions—A rugged, four-bolt back head, Thor positive, short-travel, tubular valve and new Thor latch-type retainer (all exclusive features) are standout reasons why Thor Breakers turn out fast, low cost high efficiency work so consistently.

For complete information about powerful, easy-operating Thor contractors' air tools, write for Catalog 42-A.

When all contractors keep tool performance records as detailed as sports records, Thor Paving Breakers head the list in their group as the record breakers—the champions of their class. Construction men, who have paving breaking and other demolishing jobs, know that Thor equipment has the capacity and stamina to do the rough, tough jobs faster, better—at definitely lower cost. *Long years of hard, on-the-job experience has taught them that basic fact.*

Workers like the easy handling that results from improved balance and absence of excess vibration—this means more production per hour, per day, per week. Thor Paving Breakers deliver more power due to "measured air"—an exclusive Thor feature. Strength, rigidity, and longer life are assured by alloy-steel drop forging construction. *Thor equipment has the speed and power to do the job as you want it done.*

WHAT THOR "MEASURED AIR" MEANS TO YOU

1 *Balanced Power*—Only a precisely measured quantity of air is allowed behind the piston.

2 *Smooth Performance*—Every stroke is powered by the same measured quantity of air.

3 *Air Economy*—Every ounce of air provides a full measure of maximum power for peak efficiency.

4 *Low Maintenance Cost*—There are no separate parts of the patented Thor valve to wear out or lose.

HOW THOR "MEASURED AIR" ECONOMY WORKS

Short-travel of the Thor valve creates a positive valve action that admits only the required amount of air—then instantly seals the inlet against excess air. Elimination of excess air avoids power overload that staggers the stroke and causes vibration.

Thor PORTABLE *Pneumatic* TOOLS

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INDEPENDENT PNEUMATIC TOOL COMPANY

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ine of Rock Crushers And Quarry Equipment

Literature describing the Acme line f crushing and quarry equipment may e secured by interested contractors nd state and county highway engineers irect from the Acme Road Machinery o., Frankfort, N. Y. This includes eavy-duty jaw-type units for prelim- nary crushing, reduction crushers, ammermill pulverizers, a variety of tationary and portable mountings for e crushers, conveyors and feeding quipment, continuous bucket eleva- rs, screens, portable and stationary ins, as well as complete crushing-plant set-ups, and gravel screening and sand washing plants.

Those interested may secure full details on this Acme equipment by writing direct to the manufacturer and mentioning this item.

Sustaining Construction Activity by Public Works

Using public-works construction as an economic balance wheel is an idea seldom understood in all its implications, according to the Chamber of Commerce of the United States. Major potentialities and pitfalls of this proposal are examined in a report "The Use of Public Works to Sustain Construction Activity", recently issued in pamphlet form by the Chamber's Construction and Civic Development Department.

Copies of this discussion of the place of construction in the national economy, of the importance of encouraging private construction to maintain a steadier flow of investment funds into new structures and improvements of existing ones, and of the necessity for planning public works in such a way as to create the maximum flexibility in order to avoid the past practices resulting in public works being pressed forward when private work was at a peak and vice versa, are available gratis. Address your requests to the Construction and Civic Development Department, Chamber of Commerce of the United States, Washington 6, D. C.

More Mack Trucks

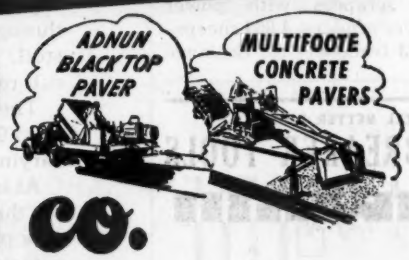
Increased production of Mack trucks is now under way, following complete lifting of wartime controls on civilian truck output, according to A. N. Morton, Vice President in charge of production for Mack Mfg. Corp., New York City. During 1946 Mack expects to manufacture more trucks and other units than in any pre-war year.

Lower Cost Concrete...

MultiFoote Pavers assure you of lower cost concrete because they get the cement and aggregate into the paver and out as thoroughly mixed concrete *faster*. Big, rugged skip has a full, wide mouth for faster charging from even the largest trucks. Double cone drum with its end-to-end scouring action mixes every batch in minimum time. Rotary discharge takes only a quarter turn to dump concrete into the big bucket. High operating platform provides greater visibility and faster, more accurate work. Write for details.

Lower Cost Black Top

Handling any mix—hot or cold—Adnun Black Top Pavers lay a smoother final surface, faster and at lower cost. With a new, 6-cylinder engine, it has still more power for handling the heaviest trucks, uphill or down. Experienced road men who have worked with other pavers agree that the low maintenance costs of an Adnun are far below those usually encountered with other machines. Check these advantages today.



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The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers

FOOTE STEPS FORWARD
ADNUN BLACKTOP PAVERS
MULTIFOOTE CONCRETE PAVERS

The Airport Market For Jobs, Equipment

Aviation Experts See Vast Era of Construction Ahead to Fulfill Need For Ports for Increased Flights

✦ WITH the National Airport Bill facing less opposition in the halls of Congress, we may expect to see the much needed civilian airport program of the post-war years, as presented by the Civil Aeronautics Administration, implemented by $650,000,000 in Federal funds. The CAA program proposes the construction of 3,050 new airports, and improvement of 1,625 existing fields at an estimated cost of $1,021,567,945 for clearing, grading, paving, lighting, and radio facilities, plus about $230,000,000 for land and buildings other than hangars.

Through matching of Federal funds by the states and communities, we should be able to invest a total of $1,250,000,000 in airports in a period of ten years to complete the comprehensive plans prepared after careful study by the engineers of the CAA. As stated by T. P. Wright, Administrator of Civil Aeronautics, this comprehensive plan will, "in general, place an airport wherever one is needed, and of the size necessary for the community's flying. It will make possible wide-spread travel in private planes, and will produce adequate facilities for an expanding air-passenger and air-freight business".

In speaking on the National Airport Program before the American Road Builders' Association, Charles B. Donaldson, Director of Airports of the CAA, pointed out that the estimated cost of the program is approximately $1,000,000,000, exclusive of land and airport terminal buildings, and "that an additional amount of $250,000,000 would be involved in the acquisition of necessary land and the construction of airport terminal buildings, not including hangars". The breakdown of the $1,000,000,000 expenditure shows that approximately 52 per cent of the total, or $525,000,000, would be required for the preparation of the sites, including clearing, grubbing, grading, and surface conditioning. The paving, which includes runway, taxiway, and apron paving, is estimated to cost approximately $400,000,000, or 40 per cent of the total. The third item is the lighting, radio, and miscellaneous work which is estimated at approximately $75,000,000 or 8 per cent of the cost.

Equipment Needs

The program has been further broken down by Lowell H. Swenson, Manager, National Aeronautic Association, into the equipment requirements to make possible the construction of the 1,806 new Class 1, the 1,101 additional Class 2, the 101 Class 3, the 35 Class 4, and the 12 Class 5 airports in a limited period of time. Mr. Swenson points out that this will require the services of 6,210 6-yard scrapers and power units; 740 12-cubic-yard scrapers with power units; 3,235 power graders; 4,664 sheepsfoot rollers; 143 trenchers for drainage ditches; 3,235 tank trucks or water distributors; 143 power shovels and a similar number of air compressors; 3,050 concrete mixers and pavers; 4,479 disk harrows; 3,193 spike-tooth harrows; 3,193 corrugated rollers for seeded areas; 1,255 asphalt plants; 1,387 asphaltic-concrete spreaders and finishers; 2,673 10-ton 3-wheel tandem rollers; 1,244 asphalt distributors; a similar number of stone spreaders and pneumatic-tire rollers; and a total of 39,503 dump trucks.

Conclusion

Examination of these figures shows that equipment manufacturers may be sure of a considerable volume of business, supplying new equipment for the construction of airports alone. Add to this the tremendous highway construction program and a continuation of the necessary maintenance program in even greater volume, to catch up with the deterioration of our pavements which cannot be replaced even in a tremendous post-war program, and there is no doubt of business, as far as labor and management are concerned, in the construction-equipment industry.

Next the engineers of design and construction have a tremendous program ahead of them, designing these airports and supervising their completion. Contractors need at least one man for every piece of equipment and in many cases two or more where multiple shifts will be operated to speed construction during favorable weather, plus the vast army of unskilled labor which is employed in the civil-engineering construction field.

B. F. Sturtevant Co. Now Westinghouse Subsidiary

The Westinghouse Electric Corp. has announced the acquisition of the B. F. Sturtevant Co., Boston, Mass., pioneer designer and manufacturer of air-handling and processing equipment, which now becomes a wholly owned Westinghouse subsidiary. Sturtevant products cover a wide range in the fan and blower field, heating, cooling, and air-conditioning apparatus.

Headquarters of the expanded Westinghouse air-conditioning activities will be located in Boston.

Industrial Engines From 220 to 280-Hp

Hall-Scott Series 400 industrial 6-cylinder engines with overhead camshaft and valve are illustrated and described with power curves showing their operation with butane, gasoline, or natural gas, in a new 20-page bulletin which is available direct from Hall-Scott Motor Car Co., 2850 Seventh St., Berkeley 3, Calif. The overhead camshaft and valve principle used in these engines eliminates the use of rollers, cam followers, push rods and links, the only moving part being the rocker arm. This eliminates lost motion, and, being located on top of the head, the valves are readily accessible for adjustment.

In writing for this bulletin please mention this magazine.

"BICKNELL BETTER BUILT"

PAVING BREAKER TOOLS

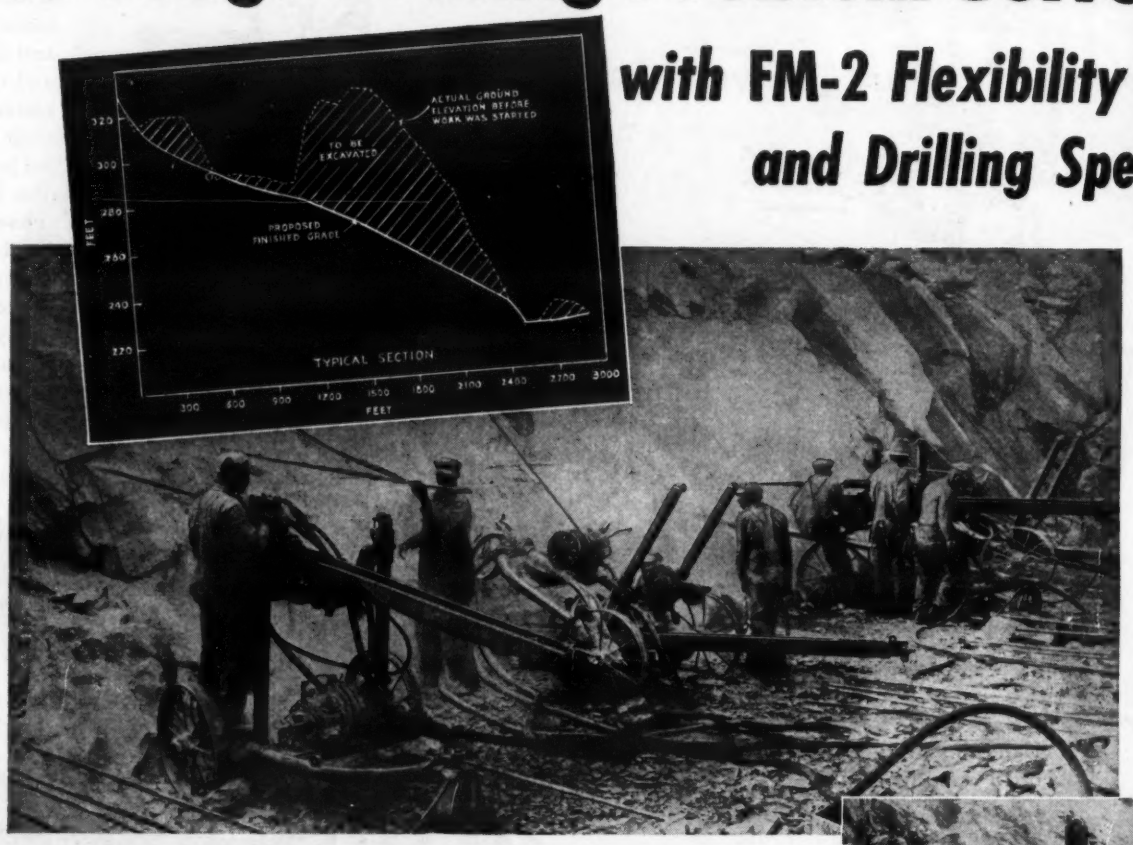
We manufacture a complete line of tools for pneumatic paving breakers, rock drills and diggers.

Write for descriptive circular

BICKNELL MANUFACTURING CO.

12 LIME STREET ROCKLAND, MAINE

A Tough Drilling Problem Solved with FM-2 Flexibility and Drilling Speed



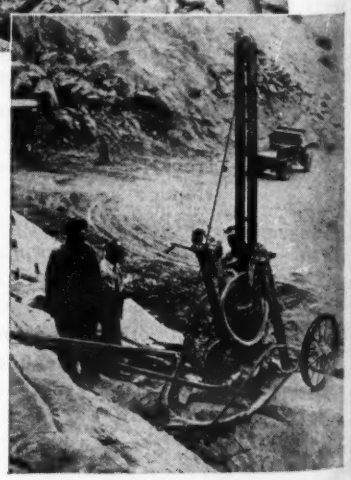
Building a suitable spillway for Dreher Shoals Dam required the excavation of 675,000 cubic yards of rock. This rock varied in hardness from granite to soft mica schist. The formation was turned up on end so that the seams were vertical. The contour of the ground, as shown in the diagram, was extremely steep.

The A. I. Savin Construction Co. of East Hartford, Conn., chose eleven FM-2 Wagon Drills for this tough job because these machines will drill holes at any angle and have the light weight required for flexibility. Their maneuverability was further increased by Ingersoll-Rand air hoists attached to the frames.

These mountings were equipped with the famous X71-WD drill. This machine, with its extremely long stroke and the heaviest piston used in any hammer drill, hits a powerful blow. It also has a unique follow-through characteristic that overcomes the inertia of long, heavy drill steel. The resulting strong rotation was ideal for fast drilling in this difficult rock formation.

Then too, the air motor feed, which has a range of feeding pressure from 0 to 1000 lbs., enabled the operators to select the right feed for the varying rock conditions.

As is typical of the experiences of all FM-2 wagon drill users throughout the country, Mr. Savin was able to obtain a very good yield of broken rock per pound of dynamite. His costs were low, and the job went along without a hitch. FM-2's on your construction job or in your quarry will give you the same dependability, fast drilling, and economy.



FM-2 flexibility permits the proper spacing of holes for most efficient blasting. More than 90% of the rock broken was small enough to pass through the bucket of a 1¾-yard shovel.

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State Maintenance Employment Policies

Most States Pay Hourly Wages for All but the Supervisory Personnel; Arguments Pro and Con

CONSTRUCTION starts and stops but maintenance goes on forever. The latter has been the major activity of highway departments in the years since Pearl Harbor and, even when construction starts again in boom volume, maintenance by state forces will continue as a prime activity. For this reason, the method of payment, hourly or monthly, and the amount of wages, in competition with other employment, are important, as is the protection afforded to employment by Civil Service, and to future security through a retirement plan. These all tend to insure the continuing integrity of the largest group of state highway department employees.

One state maintenance engineer writes, "We have learned the true value of trained personnel in highway maintenance. We should do all we can to make career jobs in highway maintenance and not just regard the maintenance foreman and patrolman as an individual with a strong back and a weak mind. He has to have a strong back all right, but he should also have a good mind."

Monthly Wages

There are a number of states which have transferred all but temporary employees to a monthly wage, but most states continue all labor on an hourly wage schedule, with only supervisory personnel on a monthly basis.

The Minnesota Highway Department changed over from an hourly basis to a monthly basis in April, 1942, following a rather light winter, in which it was impossible to employ all maintenance personnel advantageously, with the result that many of them were working on short schedules and had their incomes very substantially reduced during the winter months. This, of course, brought hardship to the men and their families, and the question then arose as to what could be done to afford uniform pay checks to the men throughout the year.

A plan was set up known as the "Monthly Pay and Compensatory Overtime Plan" in which the men receive regular monthly pay checks, but during the summer months, which is their busy season, the men are allowed to work overtime, and a part of this overtime is credited to what is known as their "Compensatory Overtime Bank". During the winter months when work is slack, these overtime hours are withdrawn from the bank and placed on the payrolls to justify paying the men full pay checks during the winter months, or, as a matter of fact, at any other slack time when they are not required on the job. As a general rule this plan has worked out very well, but, of course, there has been criticism on the part of some of the employees, which would no doubt be true of any plan under which they were working.

During the spring of 1944, the operations of the plan were again reviewed with all the employees, and apparently about 95 per cent were well satisfied with it. There was, however, some tendency to the opinion that the compensatory overtime feature should be dispensed with and employees paid their salary checks regardless of whether they could be usefully employed, and any overtime required should be paid for as cash overtime. This opinion was limited to a few employees, while the vast majority still felt that the compensatory overtime feature was fair.

Effective August 1, 1944, Minnesota found that because of the man-power shortage it was necessary to increase the regular working hours of the maintenance organization. Therefore, the work week was extended from 40 to 45 hours and the employees were paid cash overtime for the extra five hours per week over and above the regular monthly pay checks. The details of the plan naturally resulted in rather complicated procedures which require a great deal of extra office work. Where men are paid on a straight monthly basis, without adjustments for compensatory overtime, office work is greatly simplified.

It is felt in Minnesota that during the war period the plan of compensatory

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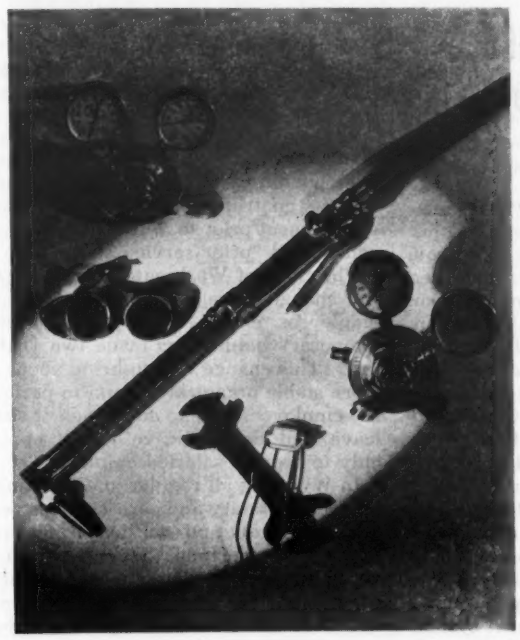

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State Maintenance Employment Policies

(*Continued from preceding page*)

overtime did a great deal towards keeping the men in a satisfied mood. Other than for military service, the Minnesota Highway Department lost very few men from its basic maintenance organization and it is quite likely that the pay plan, together with the fact that the men did not care to lose their permanent Civil Service status, had a great deal to do with keeping the men in state service.

Nebraska has 300 monthly maintenance employees and 800 laborers of various grades, or 25 per cent less than before the war. Consideration is being given to placing the men on a monthly basis during any post-war adjustment that may be necessary. This will, to a large extent, depend upon whether or not some retirement system with a Civil Service plan is created. The Department looks with favor on such a plan, but its establishment would require the enactment of laws by the State Legislature to govern such a system.

Pennsylvania placed all maintenance employees on a salary basis on January 1, 1944, at rates which provided an increase over the hourly wages formerly paid. It is felt that the principal advantage of the salary system is the fact that employees are assured of stability of employment and of annual income, with the additional advantages of vacations and membership in the State Employees Retirement System. The salary system has met with general approval. Even though the men are not paid overtime for emergency work, no difficulties have been encountered in instances where it has been necessary for them to work considerable overtime on snow removal and surface-treatment operations. Furthermore, the overall efficiency has been improved, since there is no advantage to be gained by an employee in making a job last and working overtime, because he does not receive overtime pay and is assured of his regular salary regardless of the type of work he is doing.

Virginia reports that maintenance employees have operated on a salary basis for a number of years. The step was taken when a ruling was made that hourly employees were not allowed to build up "prior service", and length of service for retirement benefits was figured only from the date of employment on a salary basis. Since the retirement benefit was started July 1, 1942, the employee and the State each contribute equal sums towards the retirement fund. At the start, the State paid its contribution for all continuous employment prior to July 1, 1942, which constituted "prior service".

The State of Washington reports that the change to salary payments for all employees except those of a purely temporary nature was made two years ago. This change was to bring about a more stable organization, and to permit the employees to take advantage of sick leave and annual leave which apply only to regular salaried employees.

In Wyoming all regular and full-time men are on salary and earn 1½ days per month vacation and sick leave and are not paid for overtime. Only temporary men are now on hourly wages and overtime. The salary basis of payment was the choice of the majority of the maintenance employees.

Illinois reports that only part-time employees are paid on an hourly wage basis, the only practical way to pay them.

In Indiana the payroll, or hourly, basis has been used over a period of years, but it is believed that the monthly-payment basis would be better in the long run.

Value of Hourly Rate

Many of the states where an hourly wage is paid to maintenance employees frankly state that the employees like the overtime paid to those working on an hourly basis and that is why it is continued. In others it is felt that overtime, either straight hours, time and a half, or double time, is the only fair way to compensate for extra hours worked at such arduous tasks as snow removal and ice control, or repairing flood damage. Another reason given by at least two states for hourly wages is the tremendous labor turnover in the maintenance division.

"Well, the Sarg told me to comb the woods for snipers!"

Florida's chief reason for continuing skilled and semi-skilled labor on an hourly basis is that hours on maintenance work are hard to define, and also that labor turnover is so great that

(*Continued on next page*)

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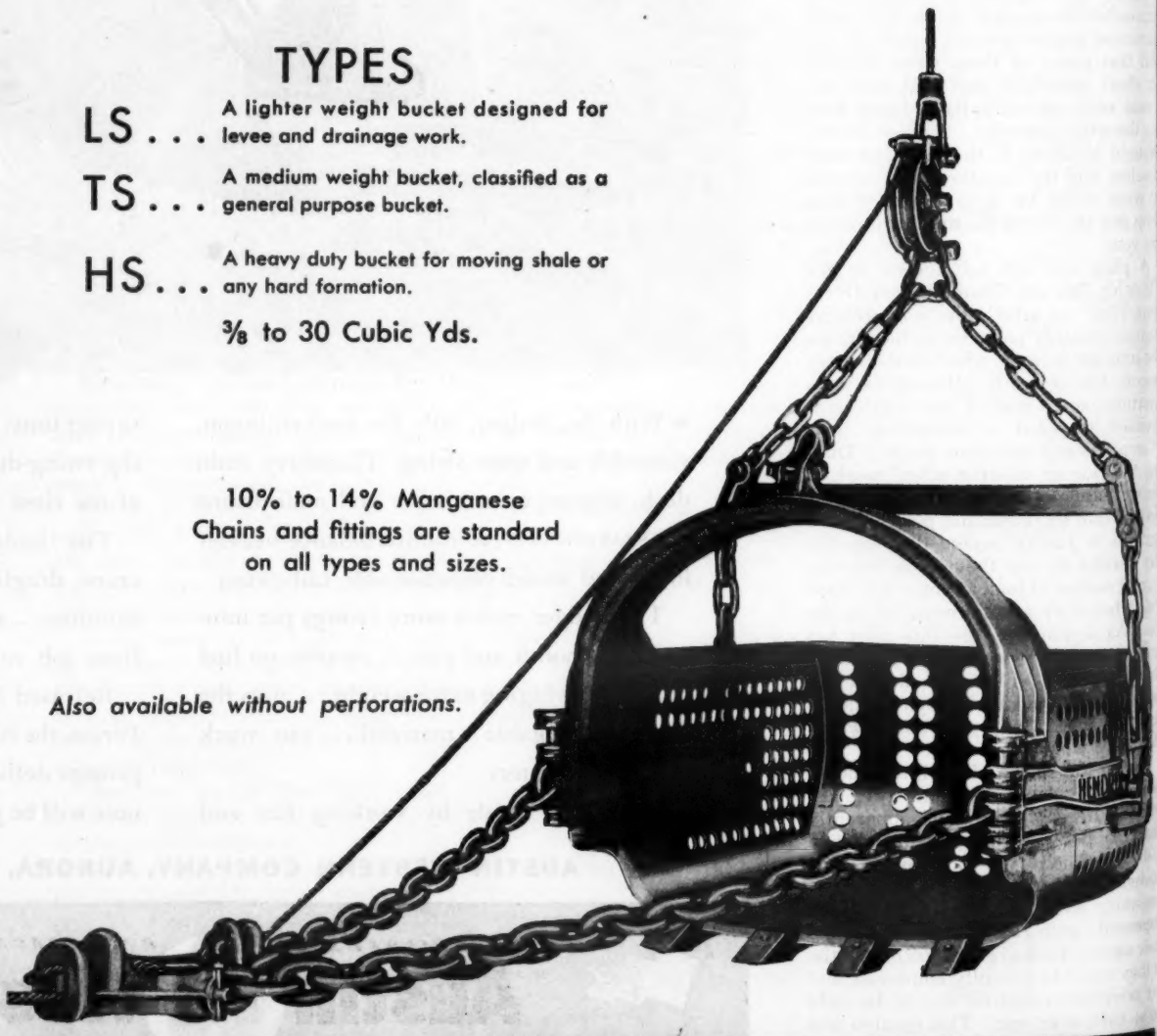

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State Maintenance Employment Policies

(*Continued from preceding page*)

does not seem practical to change maintenance employees over to a monthly rate, although it is felt that the Department may be forced to do so in the future. Similarly Alabama feels that the hourly rate is necessary because of the great turnover in the employment of labor on maintenance operations.

Iowa reports that foremen and mechanics were changed to an hourly basis about a year ago so as to be the same as all other maintenance men. The men prefer the hourly basis because of the considerable overtime worked. Iowa does not consider it fair to ask men on weekly or monthly wages to put in overtime, particularly as much of this overtime cannot be uniform. For example, a group of men in a part of the state where there is a lot of snow and therefore a lot of overtime would be receiving the same amount of money per month for long hard hours of snow removal as men in some other section handling only routine maintenance. Iowa pays straight time for overtime, with no time and a half or double time.

New Hampshire is another state which believes that the extra hours worked during some seasons should be paid for as overtime and that this is best done through hourly wages. Similarly North Dakota reports that it is necessary to work most employees considerable overtime due to the shortage of labor, and the hourly pay method takes care of this overtime. In South Carolina, skilled, intermediate, and unskilled labor are paid hourly rates because their hours are somewhat irregular and it is desired to compensate them for the time actually worked, including overtime when necessary. The report from South Dakota states that since field maintenance men are required to work considerable overtime, the Highway Commission believes it advisable that the men operating patrols, trucks, bituminous distributors, and power mowers be paid on an hourly basis.

In Utah all maintenance men except supervisors are paid on an hourly basis. This practice has been continued because, since the man-power shortage, it has been necessary to work the men overtime, particularly during the oiling season in the summer and snow removal in winter. In Vermont the hourly basis of payment is continued because so many men work only part of the season and have other employment during the winter. When extra hours are required due to unusual conditions, the men are duly compensated by overtime when on an hourly wage.

Kentucky believes they get better results for the money expended with hourly pay. Maryland reports that the hourly basis has been continued as an old policy that was probably determined by the factors of greater control and economy, but states that whether this policy is the best one is an open question. New York uses the daily and hourly basis of payment for men in field work as the men are suspended due to lack of work from time to time and, in general, the employees seem to prefer the hourly wage.

Michigan reports that no serious consideration has been given to paying maintenance employees on a salary basis. However, from the experience of a few county highway organizations in Michigan that have tried the salary arrangement, it would appear unsatisfactory, principally because men did not report for work during emergency storm operations in the winter period.

Massachusetts reports that although all labor service employees are paid on an hourly basis, this amounts to a salary as they are permanent employees working under Civil Service on the basis of a 48-hour week. Saturday half holidays are granted at all times except when the men cannot be spared due to an emergency. All workmen are paid for holidays and are paid overtime at the regular rate until the employee has actually labored 48 hours during the week, then at time and a half. In addition, all employees are given an allowance of 15 days per year sick leave and vacations ranging from one week for nine months' service up to four weeks after ten years' service. These men were placed on Civil Service in 1941 in order to give them the benefit of security. There were no increases in rate involved at the time. A temporary increase in payment was instituted July 1, 1943, and it was undoubtedly this temporary increase and the security provided under Civil Service that prevented the Department's losing a great many employees during the war.

New Jersey reports that all supervisory employees are on a monthly basis, the balance being classed as laborers and paid on an hourly basis. For a number of years a limited group classified as laborers (highway maintenance patrolmen) were on the monthly payroll. These men received a minimum in excess of $100 per month. Under the reclassification program, no monthly employee receives less than $1,200 per year. Statistics showed that the hourly-basis employees averaged higher than the monthly employees, with the result that there was considerable dissatisfaction. At the present time, an endeavor is made to furnish a minimum of 44 hours per week employment, although such a minimum is not guaranteed. This 44-hour week is spread over Monday to Friday inclusive. Where 44 hours have already been worked in the first five days of the week and it is necessary, by reason of

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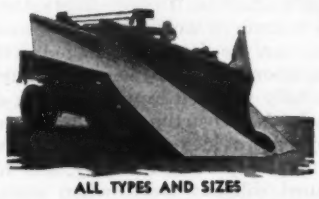
It Still Pays to ORDER EARLY



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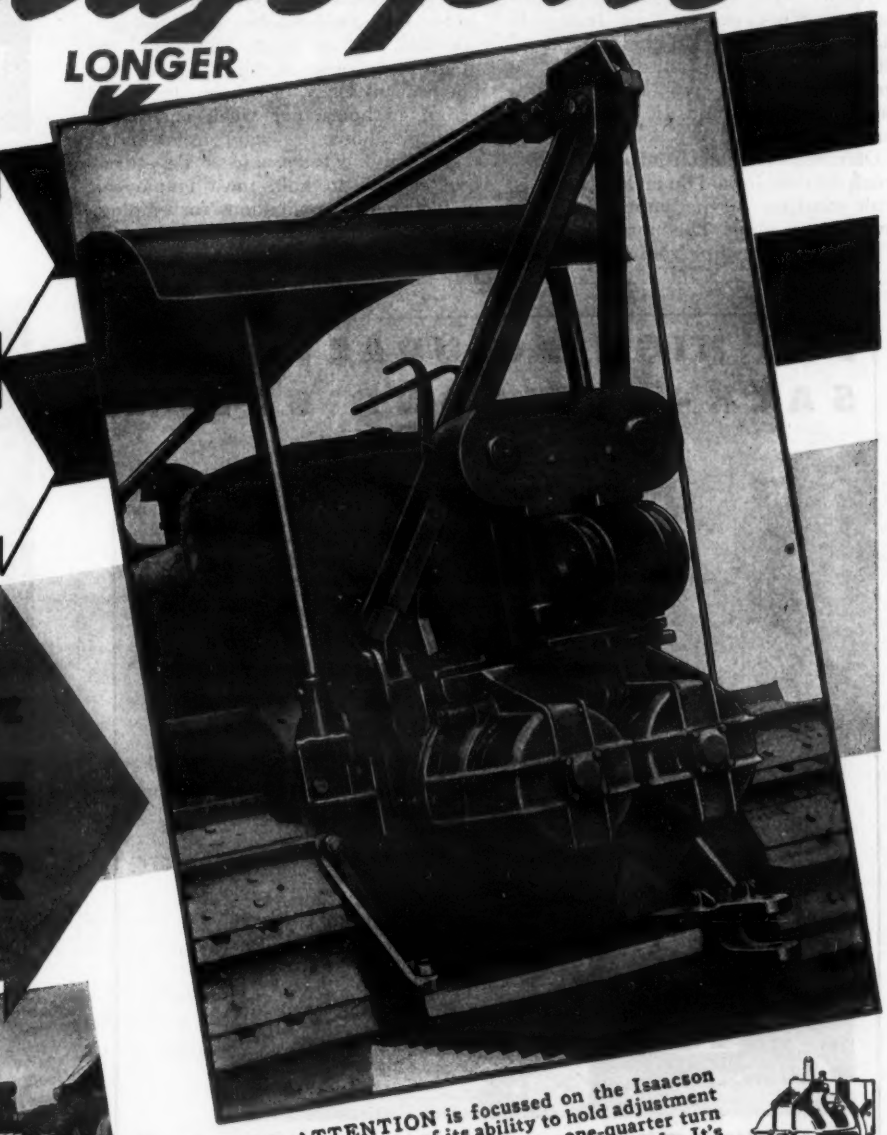

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State Maintenance Employment Policies

(*Continued from preceding page*)

some emergency, to work on Saturday, the rate of pay for Saturday is time and a half. Work on Sundays and some twelve legal holidays calls for a double-time rate. In addition, any work performed between 6 p.m. and 6 a.m. is paid for at a rate of time and a half. This latter factor alone constitutes a very important element, particularly during the winter months when ice-control and snow-removal operations are involved. Up until the year 1938, when garage employees were placed on a monthly basis, they were paid for the actual number of hours they put in on the job. During the hourly-basis period there was no difficulty whatever in getting these employees out for snow-removal operations. They, in fact, did not even have to be called in many cases but appeared for work. Since the monthly basis has gone into effect, however, there is considerable grumbling about overtime work and, in some cases, it is impossible even to find the men, with the result that operations are interfered with by a shortage of personnel. It is believed in New Jersey, in view of the results in the Equipment Division, that if the entire labor force were placed on a monthly basis this same difficulty would doubtless be experienced.

Ohio reports that all labor, including truck drivers, is paid on an hourly basis, with overtime at the same rate when emergencies arise. The monthly income of hourly-paid employees is generally stabilized by the policy of shifting to other suitable work when inclement weather interrupts normal seasonal operations. On the other hand, accumulated overtime is offset by time off, if possible, within the semi-monthly period in which the overtime has been accumulated. Farmers living along the highways can be employed during seasonal operations when regular forces are unable to handle the surge of work. Examples of this are mowing weeds, and spreading cinders and chemicals on particularly dangerous spots within a short time after snow or ice makes the sections hazardous. In fact, fluctuations in the volume of work, due to seasonal surges, can be better managed with both temporary employees and regular forces fully satisfied by payment on an hourly basis. Overtime pay for regular employees provides an added incentive for prompt reporting for duty, and for continued diligent work when emergency conditions cause employees to be called out during "off hours". Particularly important is the interest taken by men stationed at outposts to start work in snow and ice emergencies and some others on their own initiative, when time is essential. Without doubt, payment on an hourly basis simplifies cost-accounting records and eliminates the possibility of personalities entering into the question of credit for too much or too little time worked for the salary received. At 48 hours per week, the monthly income of hourly-paid employees in Ohio has been increased (from 40 hours per week and lower rates per hour pre-war) to meet increased living costs, and to be attractive enough to hold most employees. In fact, many applications for employment have been received during the

(*Continued on next page*)

Back on the job for peacetime construction, this new Heil CE 18-TW trailbuilder mounted on an International TD-18 tractor is clearing the way for one of the many new roads needed in our post-war highway system.

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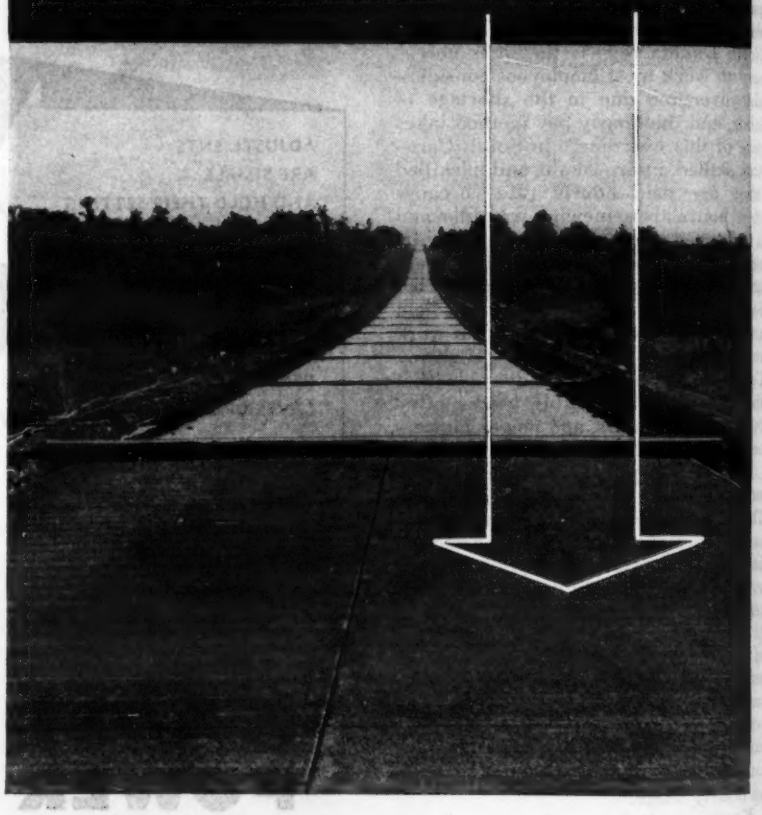

THE unretouched picture above of a newly laid highway tells more than anything we might say about concrete curing with Sisalkraft blankets. It shows the water in the original mix still retained, and the concrete comparable in strength with that obtained by immersion curing!

Only two men are needed to roll the Sisalkraft blankets in place after the concrete has been laid. After curing the Sisalkraft blankets are easily rolled up, ready to be used again. Much time and labor are saved.

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tate Maintenance Employment Policies

(Continued from preceding page)

st few years in some parts of the state hich are not located within industrial reas.

Oregon states frankly that, fundaentally, the reason for placing maintnance employees on an hourly wage that it is in accord with the practice most industries. It is felt that it is t fair to require the men on a monthly ayroll to work overtime, even in emerencies, without extra compensation. he state laws of Oregon require the yment of double time for the workg of state employees more than 8 ours in one day or 48 hours in one eek, except foremen and supervisory mployees. It is very difficult to comute overtime based on monthly rates; is much more simple to do so when ourly rates are used. The foremen nd supervisory employees, when reuired to work overtime, are given exhange time in lieu thereof. Both ourly and monthly men are given acation and sick leave with pay. Oreon highway officials feel that there hould be no difference in overall effiiency. It is up to the foremen and upervisory employees to see that the ork is carried on in a proper manner nd to hold overtime to a minimum. his they do in Oregon. It is not beieved that the same salary should be aid regardless of the type of work one. If a man is required to do and as the requisite experience for more killed work, he should receive commensurate pay.

Rhode Island states that the chief eason for continuing on an hourly asis is that it gives the employees an ncentive to report promptly in emerencies, such as severe windstorms, nowstorms, icy road conditions, and ther emergencies, which occur on Sunays and holidays. Employees called utside of regular working hours in Rhode Island receive overtime pay of ime and a half.

In Texas, hourly wages are paid to ommon, semi-skilled, and skilled laorers, while supervisory employees re on a monthly salary. The hourly ates provide a method of rapidly increasing the number of laborers for hort-term employment and there is an ncentive for doing better work in orler to remain on the payroll. In genral it is felt that it is more economical o pay hourly wages than by the month. n response to the question "What are your chief reasons for continuing on an ourly basis?", Texas replied, "This uestion is indeed a thought-provoking one, and we are not at all certain that any reasons which we might give in favor of the hourly basis of employment would stand the extreme test. This olicy of employment was adopted many years ago and has been very atisfactory. It is human nature to continue a given policy so long as the policy s not out-moded. Through the studies which we are now making we hope to letermine the desirability of a change, f any".

Overall Wages

The Maintenance Personnel Committee of the Maintenance Department, Highway Research Board, made a preliminary report at a meeting held in Cincinnati, Ohio, November 26, 1944, on maintenance wages and other personnel problems in the maintenance divisions of state highway departments. This report, with extensive tabulations, is to appear in the Twenty-Fourth Proceedings of the Highway Research Board, to be published shortly. For the purpose of this study, highway maintenance personnel was divided into ten classifications from common labor to state maintenance engineer, and each classification is defined and given a title. In relation to wages the report states:

"A tabulation of the salary or wage of the various classifications of maintenance employees shows a wide variation in sections of the country as well as a wide variation over the country as a whole. (All hourly wages as well as salary in each state were converted to a monthly salary for tabulation purposes.)

"To illustrate this wide variation, it is noted that the monthly average wage of common labor varies from $72.80 to $167.44; skilled, from $104.00 to $239.12; equipment operator from $87.50 to $236.90; mechanic from $115.00 to $234.00; section man from $110.00 to $197.60; gang foreman from $122.50 to $286.25; garage foreman from $132.50 to $307.50; district maintenance engineer or district foreman from $169.00 to $378.33; division maintenance engineer from $200.00 to $380.00; state maintenance engineer from $275.00 to $833.33.

"These wide variations in earnings are due to a small extent to a variation in the number of hours worked, but the greater cause of the variation in earnings is the difference in the basic wage or salary rate. For example, the average wage per month for skilled labor varies from $104.00 in one state to $239.02 in another state, yet it so happens that each of these states has a 48-hour week."

Civil Service

In addition to the states in which Civil Service has already been mentioned and to the listing in the accompanying tabulation, New Jersey reports that all employees in the State Highway Department, including hourly labor, are under Civil Service and are entitled to twelve working days' vacation with pay per year and fifteen days' sick leave with pay per year. The vacation allowance is increased to sixteen working days per year after nineteen years of service. Sick leave is cumulative if not used during the current year. There are also some twelve legal holidays per year with pay.

New York states that all positions of highway general maintenance foremen, highway light maintenance foremen, and highway maintenance supervisors are in the competitive Civil Service class while all other titles are not.

Retirement System

On the subject of a retirement system for state highway employees, there is rather a complete report from Connecticut. The Connecticut State Employees Retirement System covers all persons in the employ of the State, excepting those on a provisional or temporary basis, with a uniform payroll deduction of 2½ per cent and a series of retirement percentages beginning with 50 per cent of the average pay of the preceding five years for those retiring after twenty-five years of service and attainment of age 55 by men and of age 50 by women. Total disability from any cause brings 50 per cent pay

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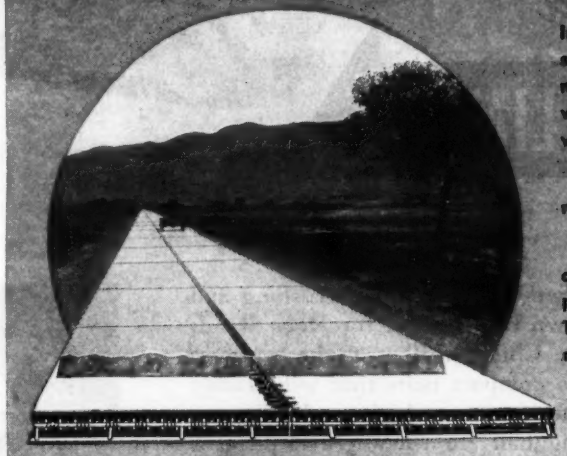
There's no Disagreement on .....

Road Joints!



A GOOD INSTALLATION WITH KEYLODE TRANSVERSE JOINTS

In the 20s and 30s when concrete road building was getting its start, it was logical for highway engineers to resist the use of metal road joints. These joints were costly and new. Their use would cut down the total miles of hard road that could be built with the money at hand—and farmers were stuck in the mud!

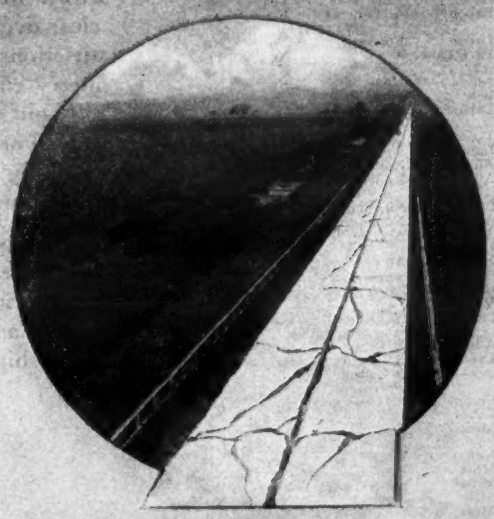
The objective *then* was *miles today*. The cost tomorrow in maintenance was a secondary consideration.

In 1934 Federal engineers, realizing the necessity for *crack control* in concrete pavements, issued a bulletin requiring expansion and contraction joints on all new federal-aid highways. The large reduction in maintenance costs on federal-aid roads attests the wisdom of this action.

Today there's no disagreement on road joints. Everyone agrees that crack control in concrete pavements by the use of load transferring expansion and contraction joints is an economic necessity. The only unsettled problems involve the spacing, the design and the cost.

The mass of available data will make it easy for highway engineers to establish a joint spacing standard soon.

Many engineers have already decided that the KEYLODE contraction joint is the design they want—and the cost of KEYLODE joints is so little that you can get BOTH *miles today* and *crack control tomorrow* for the same money.



A POOR INSTALLATION WITH NO TRANSVERSE JOINTS

Write for Bulletin

HIGHWAY STEEL PRODUCTS CO.

Chicago Heights, Ill.

KEYLODE

CONTRACTION JOINTS

State Maintenance Employment Policies

(*Continued from preceding page*)

after fifteen years of service, and there is a mandatory retirement provision for ages 70 and 65 respectively. State highway maintenance workers on an hourly basis participate in the retirement system the same as salaried employees and a substantial number have retired since the enactment of the law a little over five years ago.

In Illinois all state highway employees who work a minimum of 900 hours a year are included in the retirement system.

New Jersey reports a State Employees' Retirement System. Up to quite recently, all ratings, other than hourly employees, with the exception of veterans, were required to become members of this system within twelve months of the time of their permanent appointment. About one year ago a move was initiated to compel hourly employees as well to join the Retirement System. This move created considerable opposition, due to certain features of the proposal, so that it did not go universally into effect.

Conclusion

We wish to express our appreciation to the State Highway Commissioners, State Highway Engineers, and Maintenance Engineers who answered our request for information for this symposium. Many expressed personal views "off the record" and all discussed their problems freely. We have not quoted any official directly, and have omitted some discussions where they partly duplicated fuller statements. Reports were received from all states except Arkansas, Georgia, and Nevada.

	Basis of Pay		Civil Service	Retirement System
	Hour	Salary		
Ala.	Common Labor	Since 1939 Supervisory & Equipt. Operators	Yes	Pending
Ariz.	Some	Some	No	No
Ark.		(No reply)		
Calif.	None	Since 9/39	Yes	Yes
Colo.	None	Since 1928	Yes, exc. Labor	Yes, exc. Labor
Conn.	Most	Foremen & Higher	Yes	Yes
Del.	None	Since 4/43	Yes	No
Fla.	Labor	All Others[1]	No	No
Ga.		(No reply)		
Idaho	Labor	Foremen	No	No
Ill.	Part Time	Yes	No	Yes
Ind.	All	None	No	No
Iowa	All	None	No	No
Kans.	Few	Since 1930	Yes	No
Ky.	Labor	Supervisory & Shovel Operators	No	No
La.	Labor	Supervisory	Yes	No
Maine	All	None	No	Yes
Md.	All	None	All exc. Labor	Yes
Mass.	Labor	All Others	Yes	Yes
Mich.	All	None	Yes	Yes
Minn.	Temp. Labor	All	Yes	Yes
Miss.	None	All	No	No
Mo.	Some	Some[2]	No	No
Mont.	Operators & Labor	Supervisory	No	No
Nebr.	Labor	All Others	No	No
Nev.		(No reply)		
N. H.	All	None	No	No
N. J.	Labor	Supervisory & Equipt. Operators	All	All Salaried
N. Mex.	Common Labor	All Others	No	No
N. Y.	Most	Few	Yes	All exc. Labor
N. C.	None	Since 7/41	No	Yes
N. Dak.	Most	Few[3]	No	No
Ohio	Most[4]	Supervisory[5]	Yes	Yes
Okla.	All	None	No	No
Oreg.	Most	Supervisory	No	No
Pa.	None	All	No	Yes
R. I.	Most	Above Foremen	Yes	Yes
S. C.	Most	Mechanics & Supervisory	No	No
S. Dak.	Most	Only Supts. & Clerks	No	No
Tenn.	All	None	No	No
Texas	All Labor	Supervisory	No	No
Utah	Most	Supervisory	No	No
Vt.	All	Only Garage Mechanics	No	Yes
Va.	None	All	No	Yes
Wash.	Temp. Labor Only	All	No	No
W. Va.	All	None[6]	No	No
Wis.	No Maintenance Department			
Wyo.	Temp. Labor Only	All	No	No

[1]Including machine operators, truck drivers, foremen, etc.
[2]Patrolmen on a monthly basis since 1923.
[3]Shop foremen, clerks, and watchmen; sign painters, and special foremen.
[4]Laborers-in-charge, mechanics, equipment operators, mechanics' helpers, common and skilled laborers, and truck drivers.
[5]County superintendents, garage superintendents, gang foremen, and timekeepers.
[6]Except county superintendents, assistant county superintendents, and a few special foremen.

Work on the construction of 9 miles of highway and railroad right-of-way at the U.S. Navy Ammunition Depot near Bangor, Wash., was begun by Caterpillar D8's with bulldozers and rippers, followed by scrapers owned by the Sound Construction Co., Seattle.

Cleveland Pneumatic Tool Forms Railway Division

The formation of a Railway Division, with eastern headquarters at 50 Church St., New York City, has been announced by the Cleveland Pneumatic Tool Co., Cleveland, Ohio. John N. Thorp, distributor of construction equipment, machinery, and railroad supplies, is the new division's eastern representative. Thorp will handle the Cleveland line of heavy-duty riveters, grinders, chippers, blow guns, and scaling tools for railway work, as well as paving breakers, hand sinkers, and backfill tampers for construction jobs and a complete line of accessories including hose, valves, and couplings.

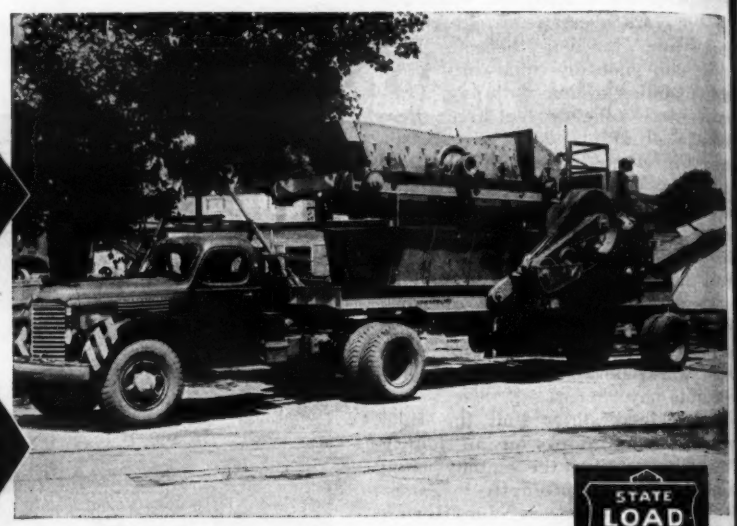
Light-Duty Applications Of Two Hydraulic Units

Two new bulletins recently issued by the John S. Barnes Corp., 301 So. Wall St., Rockford, Ill., are devoted to Barnes self-contained hydraulic units and their installation and maintenance.

The Type 139 unit, featured in Bulletin 012-G, is a complete self-contained hydraulic power plant designed for a wide field of light-duty applications. This bulletin also describes and illustrates the Type 138 reciprocating cylinder. Bulletin 013-G is devoted to pointers in the installation and care of these units to insure trouble-free service and maximum efficiency.

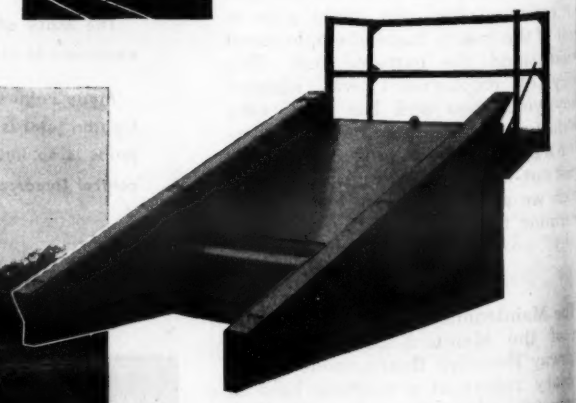
Copies of either or both of these bulletins may be secured direct from the manufacturer by readers of CONTRACTORS AND ENGINEERS MONTHLY who refer to this brief review.

This beats "LOW BRIDGE" and "LOAD LIMIT"!



The Universal Two-Unit screening, crushing and loading plant shown below, built for Rock Roads Construction Co., Chicago, Ill., can be *squeezed down* in a jiffy to compact units that will readily clear overhead structures, meet highway loading restrictions, and "highball" to a new gravel pit at a merry clip. The wedge-shaped unit pictured below slips out and permits screens to be lowered. Delivery conveyors quickly fold back as shown. The primary crushing unit is illustrated above, and the secondary reduction unit at right.

This plant averaged 300 cu. yds. per hr. on the Janesville, Wis. airport job recently — is quickly returning its cost. Universal quarry plants are just as flexible and mobile. Look to Universal for *continued* leadership in crushing plant design and construction.



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Big Responsibility For Rural County

Jobs for Its Service Men And Plans for Road Work Are Ready; Expects to Take Over Town Roads

By VERNON E. DAY, County Engineer, Sheridan County, Kansas

WITH a population of less than 6 to the square mile, Sheridan County in northwestern Kansas is up-and-coming about the future of its people and its roads. Within the 900 square miles of the flat plains of the county, the people raise over $2,000,000 worth of wheat annually, in addition to domestic crops. The population is mostly rural; 3,864 of the 5,020 live outside of the few towns which include Hoxie, the county seat.

Finances

Sheridan County has a road and bridge fund budget of about $31,000 each year. As Kansas counties operate on the Cash Basis Law, it is not permissible to exceed this budget. A mill and a half is levied for the road and bridge fund, and the County also receives a share of the state gas tax, current tax, state tax residue, and back taxes.

Counties in Kansas are allowed to place in a Special Equipment Fund 25 per cent of the total receipts taken into the road and bridge fund, at the end of the year. This money can be spent for equipment at any time it becomes available. Sheridan County has taken advantage of this for the past three years, and now has a nice nest-egg laid up for the purchase of some of the equipment needed for its post-war program.

Road Crews on Double Shifts

Selective Service has taken about all the man-power from Sheridan County. In order to maintain the roads and cut the weeds, it has been necessary to work the county employees in two shifts which gives an average of 3 or 4 more working hours for the equipment. The men are trained so that they can take any machine out on the road and operate it. In this way the County is able to use its help where it is most needed.

Sheridan County is fortunate in not having very many bridges either to build or maintain. The larger percentage of the bridges are pile trestles, with a few scattered rock and concrete structures. It has not been possible to build any new bridges recently because of scarcity of material and labor.

In order to keep a constant check on its bridges, the County has a complete filing system with a card for each bridge and culvert. This card gives information as to the location, size, kind, and material, as well as the drainage area served by the structure. When the survey for this inventory was made and a map prepared, it was found possible to move some of the metal culverts from locations where they were not needed and install them where additional drainage was necessary, thus effecting better drainage at little cost.

Real Post-War Plans

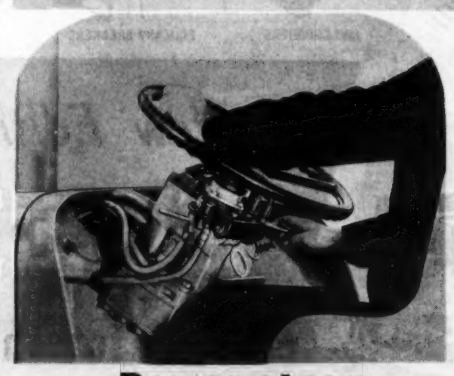
Sheridan County is ready with its post-war program. There are several county employees in service and their old jobs will be waiting for them if they want them. Letters received by the author state that they want to have plenty of work ready to be done when they come home.

Plans are being made to surface all roads on the county system and build some new bridges. The townships and towns also have projects ready to go when materials and labor are available. Many roads will have to be regraded and raised and the ditches cleaned before resurfacing can start, as the dust storms of 1934 and 1935 filled in most of the ditches of east and west roads. It has been found that the most economical way to do this work is to give the

(*Concluded on next page, Col. 2*)

HEIL Hi-Speed Cable Scrapers

dig *capacity* loads.. faster..easier..without voids or waste



Power-steer short-radius turn

Even in heavy going and over rough construction roads, the Heil Hi-Speed Tractor steers with the ease of the conventional passenger car. An engine-driven hydraulic pump furnishes steering power controlled by the steering head. The wheel is merely the hydraulic control-valve lever for the power steer. In addition, it can be operated manually to provide ample steering control in case of failure of the power system. Powerful in action, simple and reliable, this exclusive Hydro-power steer saves time and cuts driver fatigue

R 53

Correct Bowl Design

The size and shape of the bowl and front gate, plus the top forward slope of the back sheet, permits excellent boiling action.

. . . conforms with natural boiling action

The dirt has a tendency to boil into a mound-like load. The Heil bowl *fits* the load—without extra digging time or spillage due to forcing dirt into empty pockets at the rear.

Because of its scientifically designed bowl and correctly pitched cutting blade, the famous Heil Hi-Speed Cable Dozer digs bigger payloads easier and faster. The bowl design conforms with the natural boiling action, forcing dirt into the entire bowl area without voids or waste. In addition, the rapid raising and lowering of the cutting bit, made possible by the fulcrum-type lift, forces all loose soil into the bowl—saving many valuable minutes out of each working hour.

Push-loaded with a crawler tractor, this unit digs a heaped 15-yard load in 40 to 50 seconds and speeds away to the fill at speeds up to 20 m.p.h.—to help you move more yardage, faster and cheaper. For further details—

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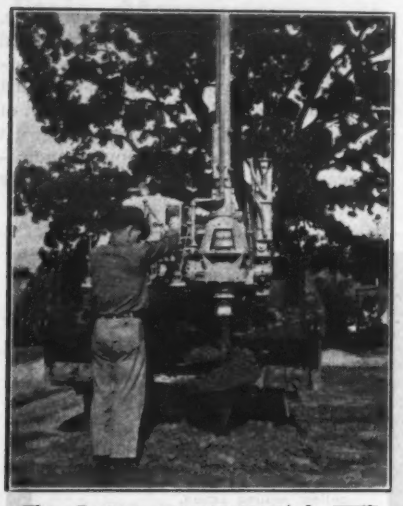


The Jaques one-man-operated earth borer is hydraulic-controlled and designed for truck or trailer mounting.

Hydraulic Control On New Earth Borer

A new self-contained earth-boring machine which is simple in design and sturdy in construction, for mounting on a 1½-ton or larger truck or trailer, has been announced by the Jaques Power Saw Co., P. O. Box 695, Denison, Texas. This hydraulic-controlled unit is driven by a separate gasoline engine, the whole machine and power unit being mounted on a sturdy steel underframe.

No manual labor is needed in plumbing this one-man machine which can bore anchor holes up to a 45-degree angle with the horizontal. All controls are within the reach of the operator and both plumbing and vertical motion of the bit are controlled by hydraulic pressure. The hydraulic feed automatically regulates the speed of drilling to suit the character of the soil. This makes possible digging holes faster without stalling the machine. The unit carries any size bit up to 24 inches in diameter and can bore to a depth of 8 or 9 feet.

These machines are also made for use on crawler tractors but when so mounted the installation is made at the company's plant. Complete information regarding the Jaques hydraulic-controlled earth-boring machine is found in a new 4-page folder which will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the manufacturer and mention this item.

Galion Offers Course In Equipment Servicing

A school giving complete instruction in the servicing of its equipment is being conducted by the Galion Iron Works & Mfg. Co., Galion, Ohio, manufacturer of road graders and rollers. Available to all Galion distributors and service men, so that they can provide expert factory service in the field, the course covers one week of intensive training.

Rural County

(*Continued from preceding page*)

ditch one cut with an elevating grader and then backslope as flat as possible.

The township roads in Sheridan County are all in need of maintenance and reconstruction. Most of the townships are unable to own any road machinery or do very much road work with the funds they receive each year. This places an extra burden on the County which tries to keep the mail routes in passable condition. Sheridan County is considering a county-operated system for all roads, and it will probably be brought to a vote by the people in the near future. This will add 1,300 miles of dirt roads to the county system, when the town roads are taken over, and the County will be required to maintain them. There are also a considerable number of bridges and culverts. When it is possible to get help and equipment to do the job right, the taxpayer can then be given the most for his money.

Road Maintenance

There is a total of 228 miles of county roads in Sheridan County, of which 103 miles are of light-type surface, and the remaining are improved dirt. As there has been only a very small crew of county road men left, it has been very difficult to do anything except the most necessary maintenance.

The county equipment consists of 2 Caterpillar No. 12 power graders, 2 large tractors, an elevating grader, a LeTourneau 9-yard scraper, a Caterpillar D2 tractor, 3 tractor power mowers, and a few trucks. All of this equipment is getting old and will have to be replaced just as soon as new equipment is available.

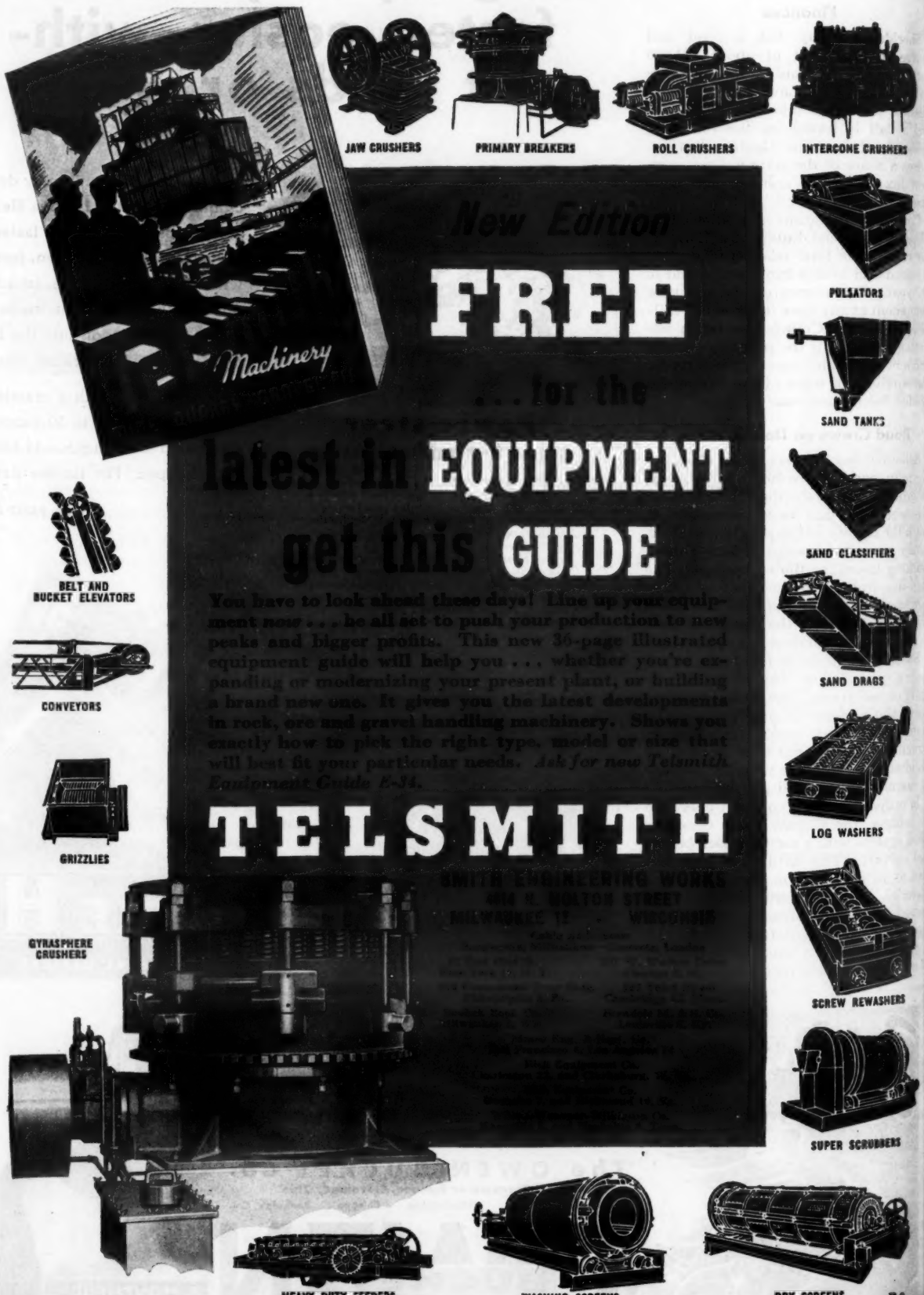
The central shop, where all equipment is serviced and repaired, is located near the courthouse in Hoxie, the county seat. The men work out of Hoxie as it is in the center of the county. Every endeavor is made to get the equipment in good shape during the winter so that as soon as the frost goes out of the ground it is possible to start heavy maintenance and reconstruction. In this way the shop man may serve as an equipment operator when there is a shortage of help.

Personnel

The County Commissioners are elected for a term of four years and appoint the County Engineer for a term of one year. The author has been County Engineer in charge of highway maintenance and construction and has acted as Purchasing Agent for highway work for the past three years. The present Commissioners of Sheridan County are: Earl L. Phelps, August C. Berndt, and B. J. Albers.

New Ceco Sales Official

Announcement has been made by the Ceco Steel Products Corp., Chicago, Ill., of the appointment of William E. Zipp as Vice President in charge of sales for the manufacturing division of the company. Mr. Zipp has been associated with Ceco since 1933.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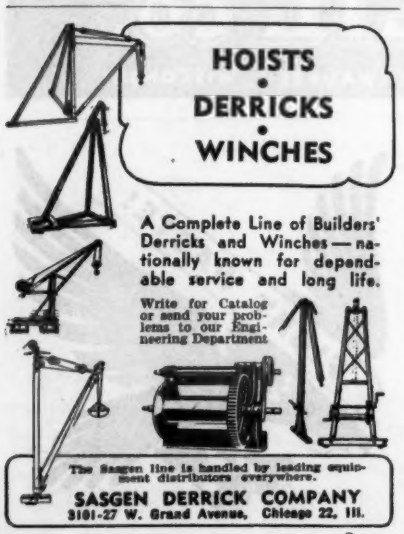
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Steel Bridge Floated 90 Miles to New Site

Careful Planning of Steps To Provide New Railroad Crossing of TVA Lake; New Lift Span Built

(Photos on pages 64 and 65)

WHEN Kentucky Dam was completed on the Tennessee River about 22 miles above its confluence with the Ohio, it created the 185-mile-long Kentucky Lake and also posed the problem of what to do about the N. C. & St. L. railroad bridge crossing the river between Camden and Waverly in the northwestern part of Tennessee. This single-track steel-girder bridge of the Nashville, Chattanooga & St. Louis Railroad not only was lacking in span length to cross the body of water widened by the construction of the new dam, but also was deficient in vertical clearance necessary for river navigation in the new deep lake.

To meet this situation, the Tennessee Valley Authority decided to use, with the exception of the draw span, the old Illinois Central bridge which had been acquired in a trade with the Illinois Central Railroad by the relocation of its track over the 1½-mile crest of the dam. Also two 70-foot plate-girder spans which had been in the temporary crossing of the lock harbor were used in the new bridge. The single-track I. C. bridge, now no longer needed, was moved upstream 90 miles and placed on new piers built 3 miles upstream from the original site of the N. C. & St. L. bridge. The I. C. bridge was insufficient in total length to cross the new lake and had no lift or swing span to permit river navigation of any size. Therefore, to the former truss spans was added a new heavy 360-foot truss lift span which can be raised 35 feet for the passage of river traffic. Moving the old bridge and the erection of the new lift span were done under contract by the Nashville Bridge Co. of Nashville, Tenn. The older N. C. & St. L. steel-truss bridge, which was inadequate because of its short spans, will be used until the completion of the new bridge and then dismantled.

Bridge Substructure

The substructure for the new bridge, consisting of seven concrete piers and two abutments, was started by the TVA in the summer of 1943 and completed the following winter. The center line of the new piers is located 100 feet north of and parallel to the center line of the highway bridge on U. S. 70 which crosses the reservoir near New Johnsonville, connecting Benton County on the west with Humphreys County on the east. The relocated railroad bridge has eight spans for a total length of 1,637 feet 5 inches between abutments. Three of its piers, one near the east bank and the two closest to the west bank, rest on rectangular-shaped concrete footings which are supported on 14-inch steel H-beams driven to 100-ton bearing. Some of these beams were welded to furnish lengths up to 120 feet. Driving was done by a McKiernan-Terry 10-B-3 steam hammer handled by a 120-foot boom mounted on a skid barge.

The other four main piers have concrete footings which were constructed within two circular overlapping cofferdams, 28 feet in diameter and 40 feet deep, made by driving steel sheet piling. Because of a fault of rock and clay running through the hard chert formation under pier No. 5, the most westerly of the main piers, 122 steel 14-inch H-beams were also driven to 100-ton bearing to strengthen the foundation for the footing. The piles were cut off and the footing built on them.

Excavation within the sheet piling coffers was done by clamshells mounted on skid barges, assisted by jetting with hose. At the time of this work, the water level was at elevation 325, but this was later raised to 359, the normal pool elevation of the reservoir. Concrete of 2,500-pound strength was used in these piers, all of which rest on hard chert. Piers 3 and 4, which support the lift span, are in line with the adjacent highway-bridge piers, affording a straight channel for easy navigation beneath both bridges. The highway bridge is at high level, requiring no movable span.

Moving a Bridge

Although the substructure of the new bridge was completed early in 1944, a contract for erection of the superstructure was not awarded until September because of the difficulty in obtaining a priority for the steel necessary for the construction of the new lift span. At that time a contract was awarded to the Nashville Bridge Co. for removing the five truss spans from the Illinois Central railroad bridge at Gilbertsville, Ky., moving them 90 miles to the site of the

(Continued on next page)

One of the old spans moved 90 miles by barge is let down to position on its piers.

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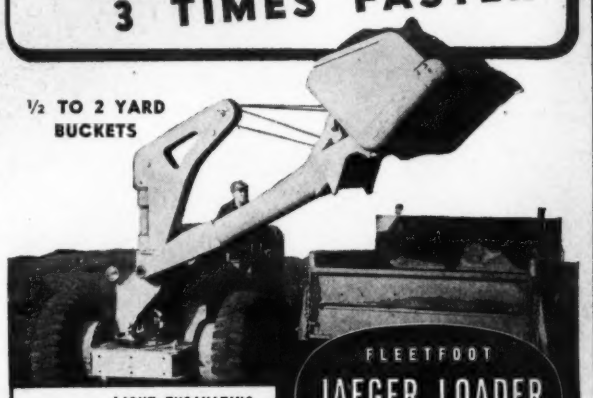

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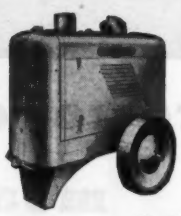

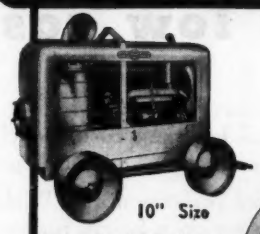

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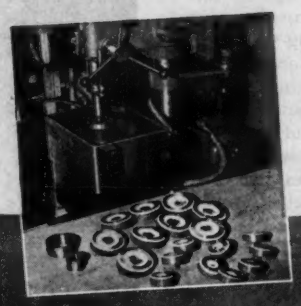

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Steel Bridge Floated 90 Miles to New Site

(*Continued from preceding page*)

new bridge, and placing them on the recently constructed piers, and also constructing and erecting the new 360-foot steel-truss lift span.

At each end of the temporary lift span in the lock harbor was a 70-foot plate-girder span which had been constructed over land bordering the shore of the harbor. Consequently a barge could not be moved under the spans at these points, thus preventing the removal of the girder spans in one piece; hence they were partially dismantled by TVA and moved piecemeal on a barge by the contractor to the new location where they were reassembled.

Two 150-foot trusses of the I. C. bridge also were constructed over land in their original position, as they are in their new location. Consequently these two pin-connected trusses had to be dismantled on timber falsework, loaded on barges, towed to the shore on each side of the new bridge, unloaded, and finally erected on the new piers. The erection of these four spans, the two 70-foot plate-girder and the two 150-foot truss, presented no great problem. Since they were over land, timber falsework was erected from the abutment out to the two piers on each side, and the steel was lifted into place by a stiff-leg derrick, where it was temporarily bolted for assembly and then riveted.

Spans Left Intact

Remaining at the old I. C. bridge site were three pin-connected steel-truss spans each 300 feet long, center to center of bearings, made up of ten panels of 30 feet. These trusses were removed from their existing location, moved upstream on barges, and placed on the new piers without being dismantled. The truss which spans piers 5 and 6, the most westerly of the four main spans, was not moved and erected until after the new lift span was assembled and put in operation, in order that river traffic would not be delayed by the bridge construction. Each of the spans moved weighs about 700 tons.

To remove each truss, the contractor used four all-steel barges, each 26 feet wide x 100 feet long, assembled in two pairs. Two barges were placed lengthwise alongside each other and held 4 feet apart by 10-inch steel angles placed along the sides fore and aft. They were set at this spacing so that the center lines of the barges were exactly 30 feet apart, the distance between panel points of the trusses being moved. Steel falsework was then erected on the pairs of barges to support the truss after it was removed from the original piers. To raise the truss from the piers, eight 150-ton hydraulic jacks operated by a hydraulic pump and an Ingersoll-Rand 110-cfm air compressor were used. Four jacks were used on each pair of barges, two being placed along the longitudinal center line of each barge 18 feet 6 inches apart, which is the distance between the lower chord members of the truss. For perfect balance the jacks naturally were set 9 feet 3 inches on either side of the transverse center line of the barges.

The other pair of barges was outfitted in similar fashion, and the two pairs were then lashed together by a 1-inch cable and towed underneath the truss to be moved. The barges were maneuvered so that the four jacks on one pair of barges would be directly beneath the second and third panel points of the truss, that is the two jacks on one barge were in position at each side of the lower chord member of the truss at panel point 2, while the other set was in a similar position at panel point 3. In like manner, the other pair of barges was beneath the other end of the truss at panel points 7 and 8. The unsupported span length between panels 3 and 7 was 120 feet, while 60 feet of truss was cantilevered out at each end beyond panels 2 and 8.

Raising a Span

The anchor bolts tying the bridge to the piers were burned off, and all eight jacks were set in motion at the same time to raise the truss clear of the piers. While it was necessary to raise the truss a distance of only 5 inches to clear the anchor bolts on top of the piers, the jacks actually made a lift of 3 feet to compensate for the settling of the barges under the weight of the truss. The jacking was done in lifts of 14 inches at a time, after which pins were inserted in the four vertical guiding girders at each corner of the steel falsework to support the truss, while the jacks were moved higher to make another lift.

The 300-foot 700-ton truss was then lowered on the falsework nearly to the deck of the barges so that the load was not top-heavy during the 90-mile tow upstream. The first truss to be moved on the four barges, which were securely lashed together, was towed sideways up the Tennessee, which at this point in its course flows almost due north, and the wave action was so strong that the two tugs found progress slow and difficult. When the remaining two trusses were moved, the tow was made with the trusses in the normal position for navigation, pointing upstream.

When the new location was reached the barges were anchored at the north side of the two piers and the truss was raised 3 feet above the level of the piers. The barges were then gradually eased into position by means of a bridge traveler with a 2-drum hoisting rig which was set up on top of the truss with its cables fastened to the piers. To get the truss well above the new shoes on top of the piers, it was necessary to jack the span 10½ feet. When the truss was in perfect alignment above the piers, it was lowered gradually into position and the barges were released for another jacking and towing operation on the other two trusses.

Assembling the Lift Span

While these truss-moving operations were in progress, steel for the 360-foot 1,600-ton truss lift span was being as

(*Continued on next page*)

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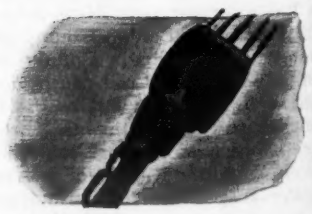

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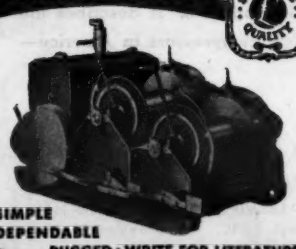

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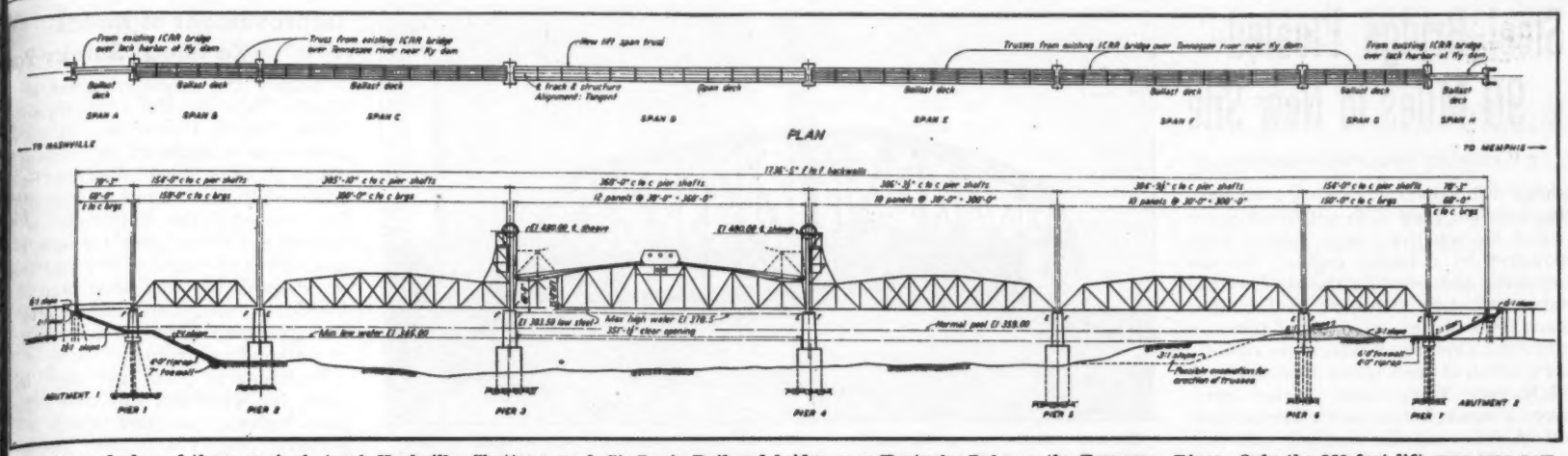

Elevation and plan of the new single-track Nashville, Chattanooga & St. Louis Railroad bridge over Kentucky Lake on the Tennessee River. Only the 360-foot lift span was new construction; the other seven spans came from an old railroad bridge and from the temporary crossing of the lock harbor.

Steel Bridge Floated 90 Miles to New Site

(Continued from preceding page)

assembled on timber falsework projecting out into the river from the east bank on the north side of the bridge. This span has a vertical lift of 35 feet which can be increased to 38 feet in an emergency. The steel was furnished and fabricated by the Bethlehem Steel Co. at its Pittsburgh, Pa., plant and shipped on three barges via an all-water route on the Ohio and Tennessee Rivers to the bridge site. The four sheaves which raise the lift span with 2¼-inch cable were made by the Traylor Engineering & Mfg. Co. at Allentown, Pa. Each sheave, has twelve grooves, weighs 27 tons, and is 15 feet 1¼ inches in diameter. They were shipped one at a time on a specially built flat car, which was blocked out at the center, and had a width of 10 feet which overhung the wheels on both sides of the freight car.

The contractor decided to assemble the lift span on falsework built over the water so that he could use the four barges with the hydraulic jacks for setting it in place on piers 3 and 4 over the main channel of the river. This 360-foot span has twelve panels of 30 feet each and was erected on thirteen pile bents, nine bents of which were composed of six piles while the remaining four had eight piles. Panel points 1 and 4 from each end of the truss rested on the 8-pile bents, which were made stronger in order to take the load of the truss when the bents under panel points 2 and 3 on each side were later removed so that the barges with the jacks could float under the span. A total of 86 piles of untreated wood with an average length of 45 feet, measuring 10 inches at the tip and 18 inches at the butt, were driven to 45-ton bearing at a penetration of from 4 to 10 feet. Driving was done by a McKiernan-Terry 9-B-2 steam hammer mounted on a barge on which was installed a crane with a 120-foot boom handling 24-foot leads for the piles.

Half the piles in each bent were driven close together under each of the two lower chord members of the truss which were spaced 18 feet 6 inches on centers. The nine 6-pile bents were capped with 12 x 12-inch oak timbers 24 feet long, while the four 8-pile bents were capped with 12 x 12-inch oak timbers 27 feet long. Each of these four latter bents was further reinforced by two caps, 12 x 12-inch x 6 feet long, one on each side. The piles in these bents had to be cut off at a lower elevation to accommodate the extra capping.

Steel Erection

The steel was unloaded from the barges and stockpiled along the river bank by a guy derrick erected on the

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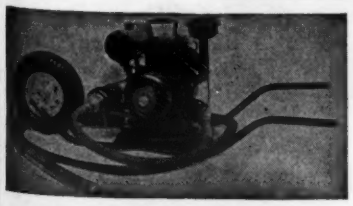

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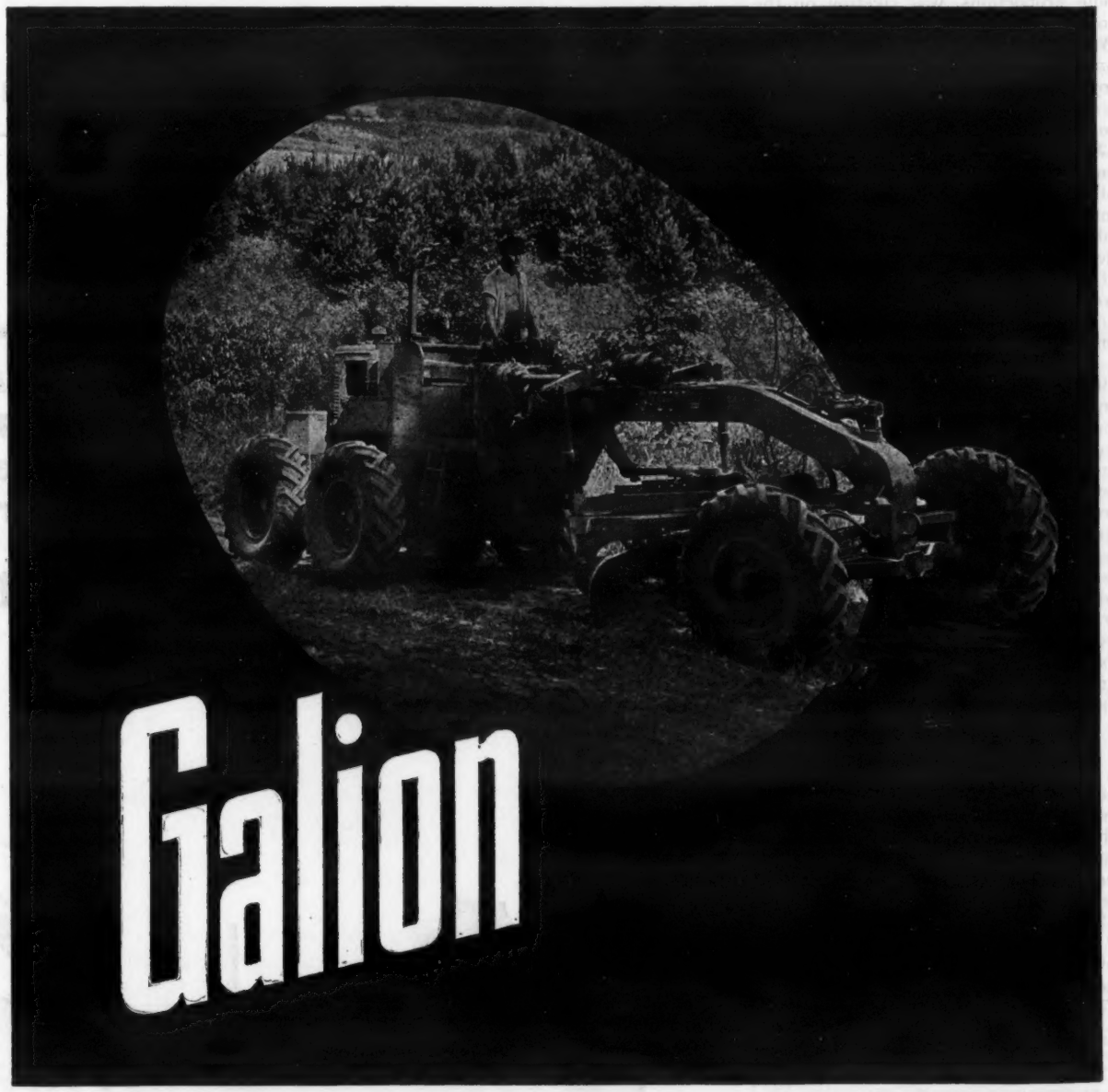

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Steel Bridge Floated 90 Miles to New Site

(*Continued from preceding page*)

shore. This derrick had a stationary leg 100 feet long with a 90-foot boom which was operated by a 2-drum hoist powered by a LeRoi engine. For assembling and erecting the steel on the falsework, two standard steel barges, each 100 x 26 feet, were lashed together to form a skid rig on which was mounted a 120-foot steel boom operated by a McKiernan-Terry hoist. Power came from a steam boiler which burned fuel oil. Another rig also used was a 90-foot boom with a steam boiler mounted on a single standard-size barge. The truss was assembled with ⅞-inch rivets and was designed for a Cooper E-55 live loading.

During the erection of the steel, an ironworker by the name of Hughes, who is called "Tennessee Slim" because of his 6-foot 3-inch height and beanpole proportions, was riveting on the top chord on the morning of Friday, April 13, when he fell from the truss and dropped 62 feet into the river below. Fortunately for "Slim", he fell in a vertical position and thus was able to thread his slender frame through a 32-inch opening between a floor beam and a cross member on the way down; otherwise his injuries would have been much more serious than the two broken ribs, and a bruised arm and ear which he received by falling into the 14 feet of water. He swam to the nearby falsework and was hauled into a boat and brought to shore. The rest of his riveting gang stopped work for the day.

When the truss was completed, the pile bents under panel points 2 and 3 on each side were removed, the four barges with their eight hydraulic jacks were floated under the truss, which was then jacked off the falsework, and towed to the main bridge piers which are 40 feet high, 26 feet long, and 15 feet wide at the top. The lift truss was raised onto the piers in the same way as were the other trusses that were floated up the river from the I. C. bridge. Two counterweights, each weighing about 800 tons, to balance the span in its vertical lift were then constructed by pouring concrete into steel counterweight boxes.

Quantities and Personnel

When the bridge is completed this autumn, the Tennessee Valley Authority will turn it over to the Nashville, Chattanooga & St. Louis Railroad. The single-track line will then be sent over the new bridge while the old bridge will be dismantled.

The major items in the substructure of the new bridge, which consists of seven piers and two abutments, built by the TVA at a cost slightly in excess of $750,000, were as follows:

Cofferdam excavation	1,785 cu. yds.
Common excavation	1,088 cu. yds.
Steel sheet piling	519 tons
Tremie concrete footings (below elev. 325)	6,630 cu. yds.
Class A concrete footings (above elev. 325)	2,638 cu. yds.
Class A concrete pier shafts and abutments	2,466 cu. yds.
Reinforcing steel	258,851 lbs.
Anchor-bolt material	13,581 lbs.

The contract price for furnishing and erecting the new lift truss, and for transferring the five spans 90 miles from the existing I. C. bridge and two spans from the temporary lock-harbor crossing to the new location was $1,030,000. F. W. Blair, Vice President of the Nashville Bridge Co., was in charge of the construction, with G. H. McMurtry, Field Superintendent. About fifty men were employed in the bridge construction.

TVA engineers on this project were W. J. Starr, Resident Engineer, and R. C. Holt and W. H. Farrar, Assistants. E. M. Arnold is Chief of Highway and Railroad Field Engineering for the Tennessee Valley Authority; K. C. Roberts is Chief, Structural and Mechanical Design Division; O. L. Hoebel, Head Railroad Engineer; George R. Rich, Chief Design Engineer; A. L. Pauls, Chief Construction Engineer; and C. E. Blee, Chief Engineer.

The photographs illustrating this article as well as those on pages 64 and 65 were furnished by the Tennessee Valley Authority.

The new 360-foot truss lift span for a railroad bridge across the lake created by Kentucky Dam on the Tennessee River was erected on falsework and then floated by barge to its final position.

Improvement of Roads To Great Smoky Par

Among the highway plans of th North Carolina State Highway an Public Works Commission is the im provement of approach highways on th North Carolina side of the Great Smok National Park. State highway officia have stressed the importance of th approaches to the park for some tim and now that some of the restrictio on highway building have been lifte the Commission is starting the progra for their improvement and the con struction of new routes.

Preliminary plans are now bein made for launching this state's three year highway program which is ex pected to reach $75,000,000. The short age of engineers is the biggest factor i the way of the actual start of the pro gram, and at least 300 engineers will b needed during the first six months afte all restrictions are lifted and material become available, State Highway Engi neer W. Vance Baise has stated.

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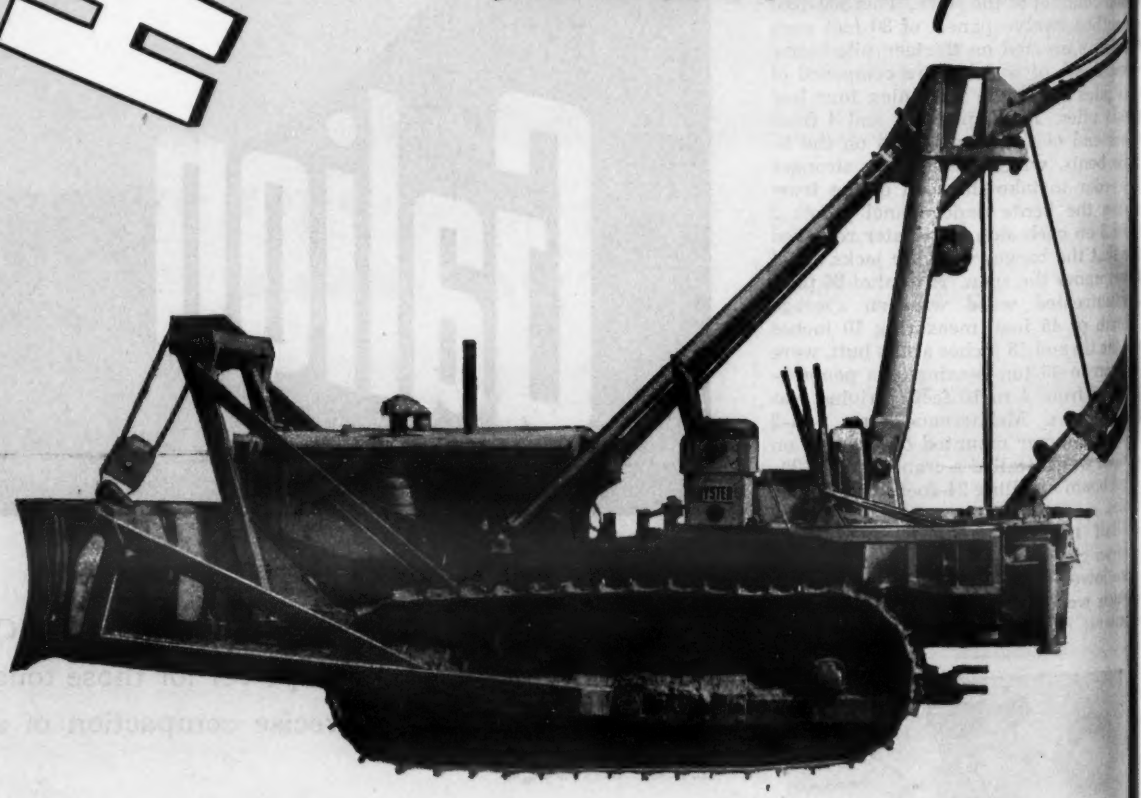

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Metal Spray Booth And Dust Collector

Many shops have been using the metallizing method of building up shafts and other worn parts of equipment, followed by machining, to make up for the lack of spare parts during these war years. The economies effected by this type of equipment care will encourage its continuance in the years to come. Ordinary spray booths designed for paint and similar materials do not solve all the problems created by strong blasts of air and metal from metallizing guns. These difficulties are now overcome with metallizing spray booths and dust collecting equipment designed, engineered, and built for handling sprayed metal dust by the Metallizing Engineering Co., 38-14 30th St., Long Island City 1, N. Y.

The line includes spray booths for exhausting to present exhaust systems, to the atmosphere, or into a Metco wet collector. Featured in the line is a lathe exhaust unit which is mounted

A Metco booth for collecting dust from metallizing spray guns.

directly on the lathe carriage and moves with it. Also featured are wet collectors and water-wash spray booths which gather metal particles in a sludge sump where valuable dust may be reclaimed for salvage.

The complete line of Metco spray booths is described in Bulletin 43A, copies of which may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the manufacturer and mention this illustrated news item.

H. A. Winne Named Head Of Engineering for G-E

Harry A. Winne, formerly Vice President in charge of engineering for the General Electric Co.'s apparatus department, has been appointed Vice President in charge of engineering policy for the entire company, effective September 1. As chairman of the engineering council, Mr. Winne will coordinate the engineering, scientific, and research projects of all departments and all laboratories of the company, and will serve as a member of the President's staff.

Door-Bell Ringing For Traffic Studies

Public-Opinion-Poll Methods Used Where Congestion and Multiple Arteries Rule Out Usual Interviews Along the Roadside

✦ WITH the great increase in the need for traffic origin and destination studies in urban areas to insure the proper location of new expressways for traffic entering and leaving cities, the Public Roads Administration, in cooperation with the Bureau of the Census, state highway departments, and local planning authorities, has developed a new and more practical method of conducting such surveys. Home interviews replace the stopping of traffic at points of concentration and interviewing the drivers or handing them questionnaires which they were requested to fill in and return by mail.

Under the new method the occupants of a representative number of sample dwellings are questioned in regard to all travel done on the preceding weekday, a method similar to the sampling technique employed in public-opinion polls. It is more economical and more effective than earlier types of urban-traffic studies. The method has been used successfully in thirty-four cities, and will be extended to other cities as post-war highway planning gains momentum.

The roadside-interview method is feasible on rural highways and in small or medium-sized cities, but in metropolitan areas, where traffic volumes are larger, it is applicable only to problems of limited scope. Traffic within an urban area is more complex than traffic on rural highways. Traffic arteries are more numerous, and parallel streets offer alternate routes of travel. Consequently, a great many interview stations would be required to intercept all traffic.

It is not possible to determine merely from observing traffic volumes where urban traffic really wants to go. In many instances vehicles travel a considerable distance out of their way to use exceptionally attractive routes and avoid congested unattractive areas.

When it became evident that urban construction would constitute an important part of the post-war highway program, a study was made of all urban-traffic survey methods previously used. After a series of conferences by representatives of the Public Roads Administration, state highway departments, and the Bureau of the Census, which has had extensive experience in conducting surveys based upon the sampling technique, the home-interview method was developed. It was first applied experimentally in traffic studies made in the early months of 1944 in Little Rock, Tulsa, New Orleans, and a few other cities.

Interview Procedure

The method, in practice, consists of selecting for home interviews a certain percentage of dwellings throughout all sections of a metropolitan area. After the dwellings are selected, the list of addresses is rigidly adhered to and no substitution is allowed. If a dwelling unit in the sample group is vacant, that fact supplies the answer, as no travel was performed by persons residing in it.

The percentage of dwellings selected for interviews varies according to the size of the city; the smaller the city, the larger the sample. In cities of 100,000 to 300,000 population, a 10 per cent sample has generally proved to be sufficient. In cities around 500,000 population a 5 per cent sample is considered adequate, and in larger cities the sample consists of one address in 25 or 30

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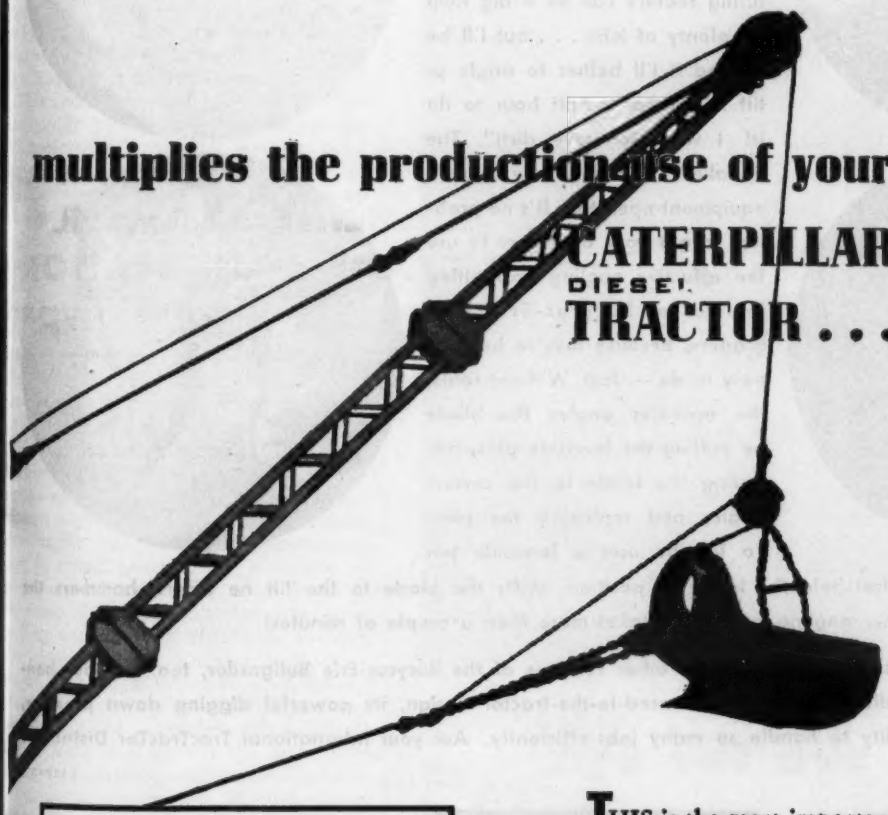

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Door-Bell Ringing For Traffic Studies

(*Continued from preceding page*)

dwelling units.

If the sample is 1 to 10 in a zone of one-family houses, every tenth house is selected for interview, proceeding clockwise around the block. If there are apartment houses in the area, each apartment is considered a separate dwelling unit and the interviewer proceeds through the apartment house, interviewing occupants of every tenth apartment.

All occupants of the dwelling are questioned concerning trips made on the preceding day by automobile, bus, or streetcar, the origin and destination of the trip, its purpose, the time of starting, the location and purpose of intermediate stops, and the use of parking facilities. In a survey conducted recently in Richmond, Va., the family income also was recorded, in an effort to determine to what extent economic status affects the volume of travel. Because of abnormal wartime conditions, no attempt has been made to record data on weekend travel.

Trucks and Taxis

The sampling technique also is employed in surveys of truck and taxi movements. License numbers are selected from motor-vehicle registration lists and the owners of the vehicles are interviewed in regard to trips made on the previous day, the origin and destination, the time of starting and ending the trip, and stops made en route. Truck owners are asked to state the type of commodity carried on each trip.

Since the number of truck trips usually is smaller than the number of trips made by passenger cars or public conveyances, the percentage of trucks selected from registration lists for investigation is greater than the percentage of dwellings selected for home interview.

Checking Results

As a check on the accuracy of the survey and the completeness of the information obtained, certain main arteries through which traffic funnels in large volume, such as bridges and important arterial routes, are chosen as control points. Traffic passing these points is counted and classified, and the results are compared with the data supplied in home interviews.

The success of the survey depends upon the ability of interviewers to elicit full and accurate information; therefore the proper training of interviewers is an important factor. Early surveys proved that mature women are the most efficient interviewers. In surveys so far, wives of service men, school teachers on vacation, and local housewives have been employed. There should be one supervisor to approximately ten interviewers. The number of persons in a dwelling unit averages about 3.3, and the interviewers generally are able to complete one dwelling unit per hour.

In nearly all traffic studies conducted thus far, responsibility for the survey has been assumed by the state highway department. Immediate direction of the work is assigned to a state planning survey division where well trained personnel is available to organize and supervise the study. Various city agencies, as a rule, assist in the work. The Public Roads Administration has usually provided the services of one or more experienced men to aid in organizing the survey and in training interviewers.

New Hole-Cutter Kit

A new compact kit of tools for cutting holes of various diameters in wood, metal, or plastics is announced by Bruno Tools, 9330 Santa Monica Blvd., Beverly Hills, Calif., manufacturer of Bruno adjustable hole cutters and expansive bits for wood boring. The new Bruno kit No. 790 is available with straight shanks for use in drill presses, or in pneumatic and portable electric drills. It contains one Model No. 1[illegible] adjustable hole cutter with ¼-inch shank for cutting holes from ⅝ to 1[illegible] inches and one Model No. 101 ¾-inch shank which cuts holes 1 to 2½ inches. The tools are equipped with high-speed steel blades having an all-purpose grind for cutting efficiently a wide variety of materials.

Additional information on this new Bruno kit No. 790 may be secured direct from the manufacturer.

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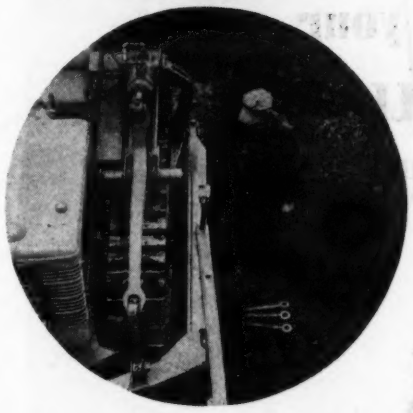

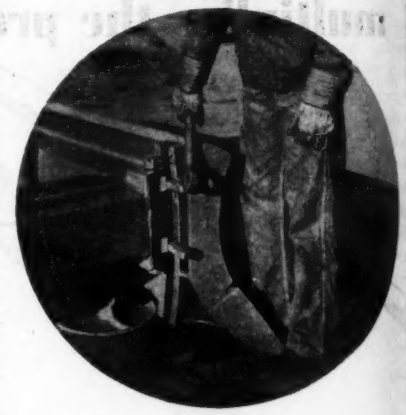

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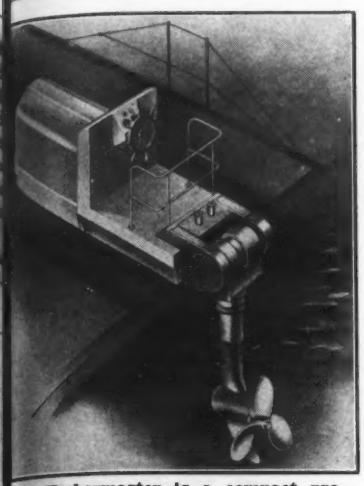


The Harbormaster is a compact propulsion unit to convert construction barges to self-powered craft.

New Propulsion Unit For Marine Equipment

Many new developments which will find application in peacetime construction have come out of the necessity for accelerated construction during the war. One of the most important of the wartime jobs was the construction of harbor and port facilities in places where no such facilities existed. Carried out for the most part by the Seabees, this work required special equipment, among which were the Rhino ferries and Rhino tugs. Power for these outfits was furnished by a propelling and steering unit known as the Harbormaster, made by Murray & Tregurtha, Inc., 2 Hancock St., Quincy 71, Mass.

This company has announced the availability of the Harbormaster for use on contractors' material barges, pile-drivers, derricks, and pump boats for marine work, to convert them from slow-moving towed units to easily maneuvered self-propelled craft. The manufacturer states that many such barges can be converted immediately by the addition of a Harbormaster unit, while in the case of others only a slight alteration to the stern is necessary. These propulsion units are made in seven models, ranging from 45 to 300 hp, with either gasoline or diesel power.

The outstanding feature of the Harbormaster is its 360-degree propeller-thrust steering control. This provides instant steering control in any direction, under full power when necessary, and is made possible by a system of gears which connect the large wheel at the head of the unit to the vertical propelling and steering shaft. By turning the wheel, the operator swings the propeller, and the steering is done by the thrust of the propeller itself, eliminating the use of a rudder. This control not only carries with it the feature of safety but makes possible precise maneuvering of the craft to the exact spot where it is required.

Another feature is the 180-degree elevating mechanism which allows the operator, either manually or by power, to angle the entire submerged section, out and backward. By angling the propulsion and steering shaft up to 30 or 35 degrees, or even 45 degrees, the operator can retain forward power and control in any depth of water in which the vessel itself will float, eliminating one of the dangers of operating in uncharted waters. It also provides ease of maintenance, since by elevating the submerged section the full 180 degrees, every part is within easy reach for repair or replacement.

As further protection against damage to the underwater section, each Harbormaster is equipped with a shear pin which automatically shears off the instant the underwater assembly strikes a submerged obstacle of sufficient size to cause damage. This action allows the assembly to ride freely up and backward, out of danger, over the obstacle, without loss of forward motion and control, it is stated. Once it has passed over the obstruction, the forward drive of the propeller pushes the assembly back in normal vertical position, and a new shear pin can easily be inserted in a minute or so while under way.

The Harbormaster is one-man-operated, is of rugged, compact construction, readily portable and easily stored, and is adaptable to all types of craft from small tugs and construction lighters to huge barges, dredges, and similar heavy-duty equipment. Further details on its features and availability may be secured direct from the manufacturer by mentioning this item.

Reclamation Program Proposed by Bureau

An immediate program of coordinated and multiple-purpose dams, reservoirs, canals, power plants, and other works to increase California's land, water, and power resources is proposed by the Bureau of Reclamation in its Central Valley Basin Report recently completed and sent to Washington. This report outlines both an immediate program which can be launched as soon as the Congress approves and makes funds available, and one for long-range developments.

The immediate program, which can be completed in fifteen years, plans for conservation works which would add approximately 1,000,000 acres to the irrigated areas of the Sacramento and San Joaquin valleys by 1960. This portion of the program would cost $527,310,000. To this sum would be added the $208,000,000 required to complete the initial features of the Central Valley Project now under construction, making a total expenditure of $735,510,000 for the entire fifteen-year program.

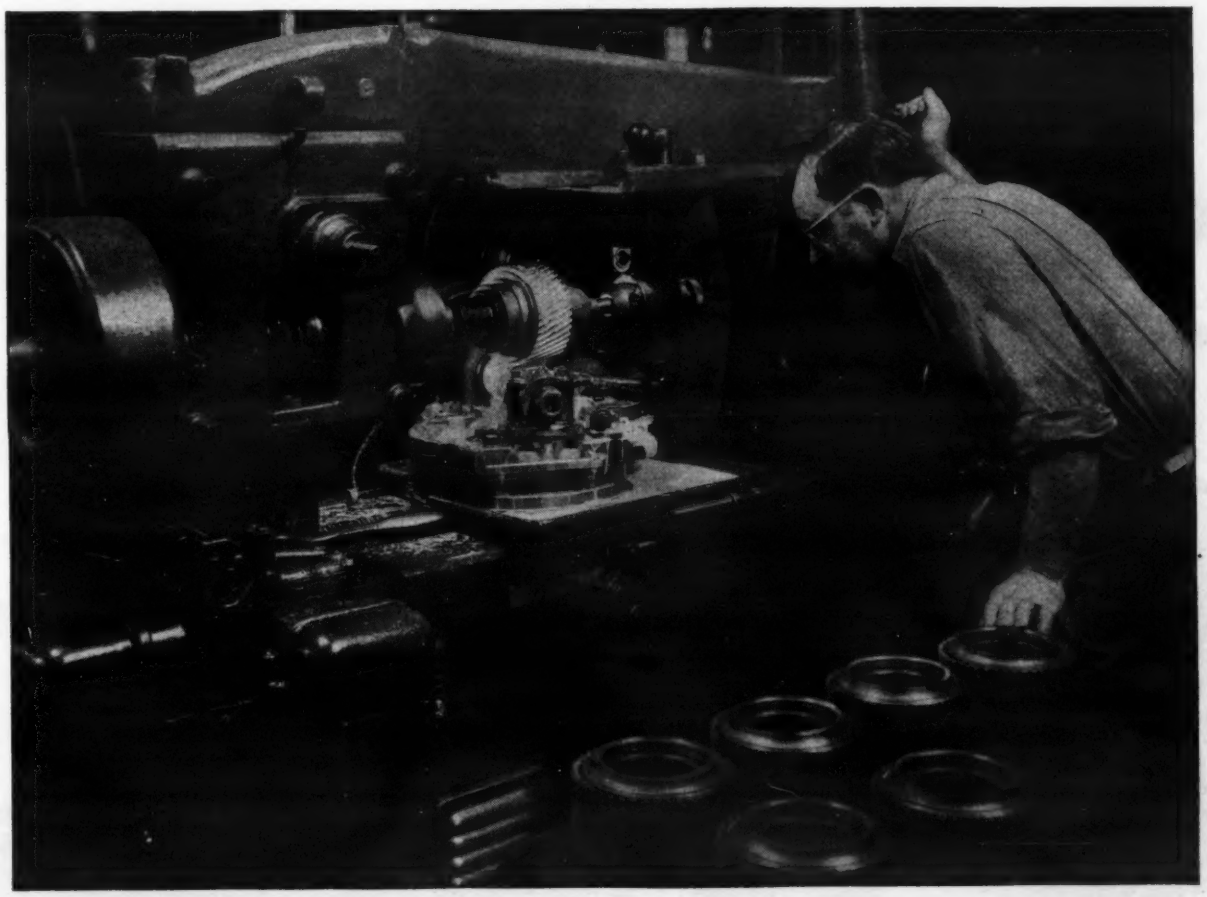
The construction of these conservation works, the report estimates, would require a total of about 550,000 man-hours of employment at the job sites and in manufacturing plants throughout the country. This means the employment of 18,000 men for fifteen years.

The hydro-electric works proposed in this fifteen-year program, together with those now being constructed, would provide nearly 1,000,000 kw of generating capacity.

New Booklet Describes Cutting Torches and Tips

A new 34-page booklet devoted entirely to Victor hand and machine cutting torches and tips has recently been issued by the Victor Equipment Co., 844 Folsom St., San Francisco 7, Calif. This line includes torches and tips for every type of cutting operation, and is designed for long service life, freedom from costly repairs, ease and speed of performance, and minimum gas consumption. In addition to text and specifications for each unit, they are depicted in attractive color illustrations. A convenient price list appears in the back.

Copies of this Bulletin No. 52 may be secured by those interested direct from the manufacturer by mentioning this brief review.



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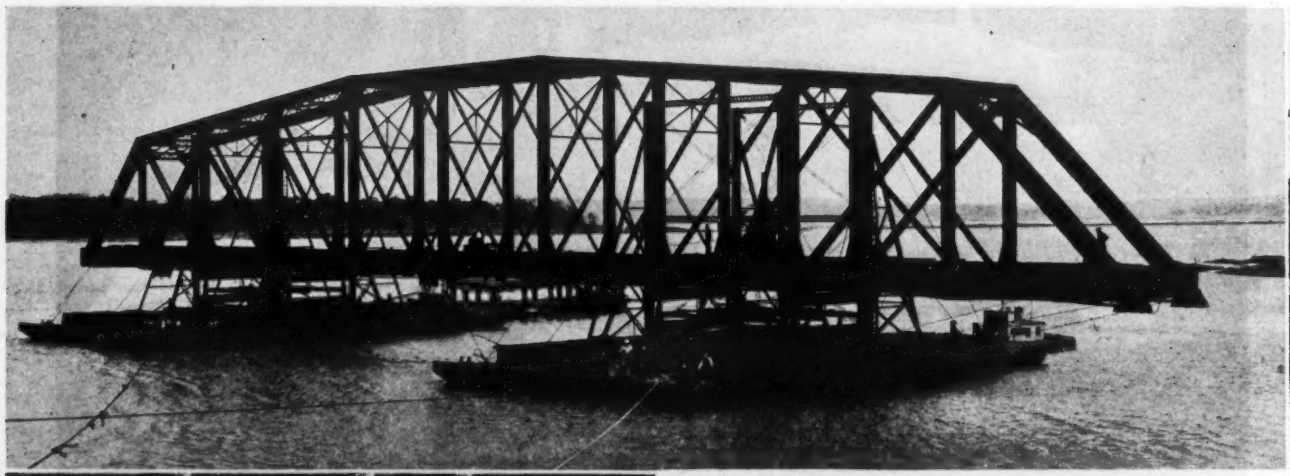
Old and New Spans In New RR Bridge

Nashville Bridge Co. Contract Involved Moving Five Old Spans 90 Miles Upstream; Building New 360-Foot Truss Lift Span

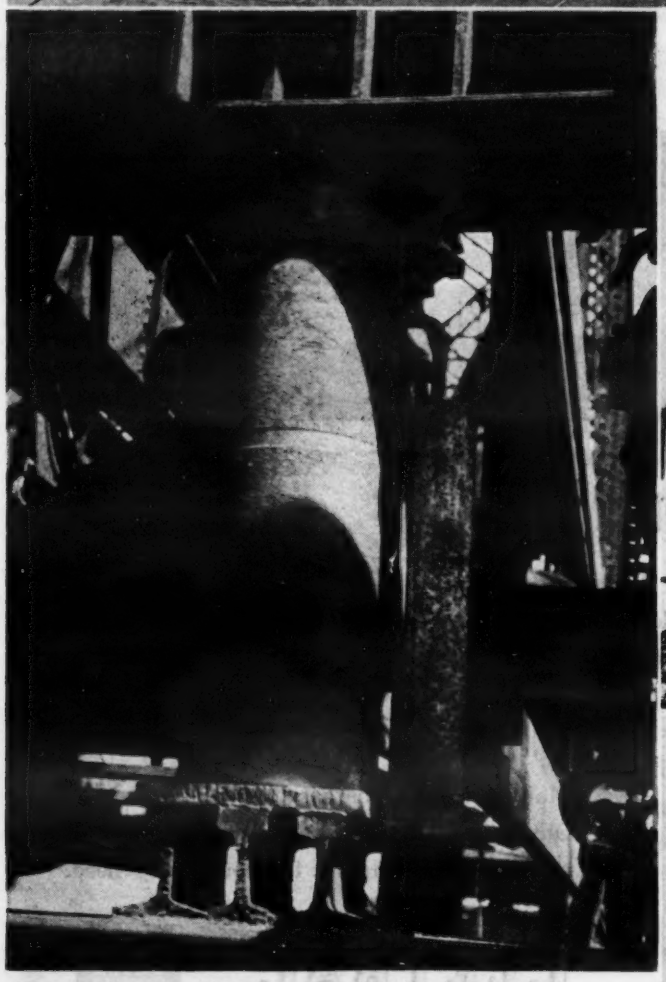
(See article on page 57)

OLD BRIDGE. [illegible] the construction of the [illegible]

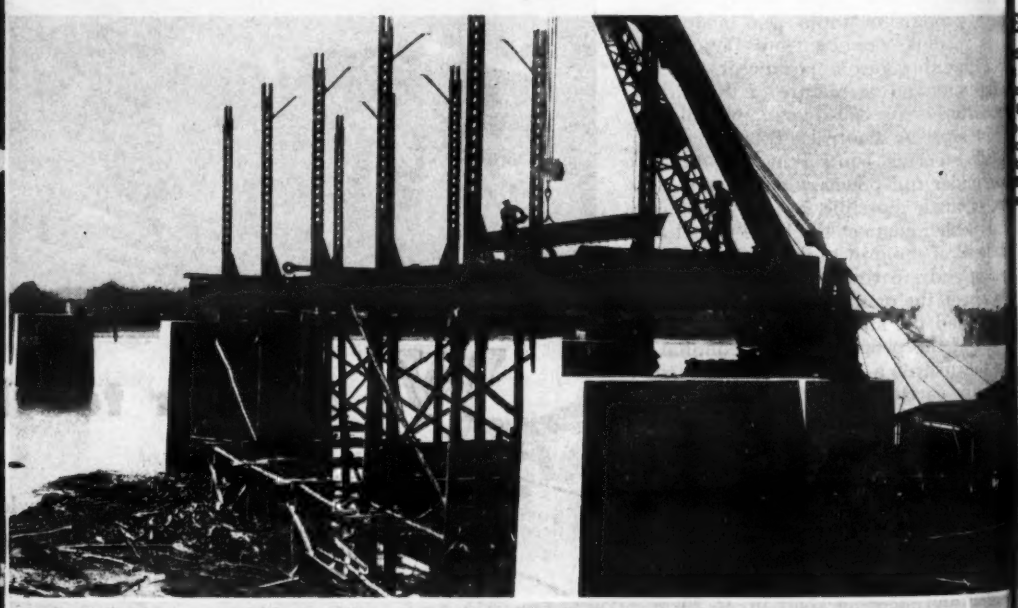


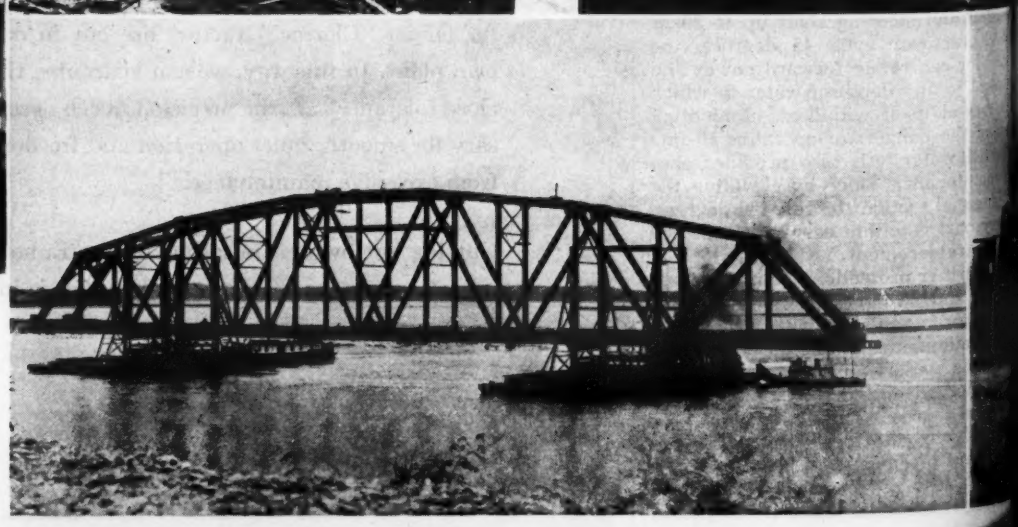
ON THE MOVE. Resting on falsework on two pairs of barges, one of the 300-foot truss spans journeys to its new location. Each of these spans weighs approximately 700 tons.

AT THE NEW [illegible] means of a bridge tra[illegible]

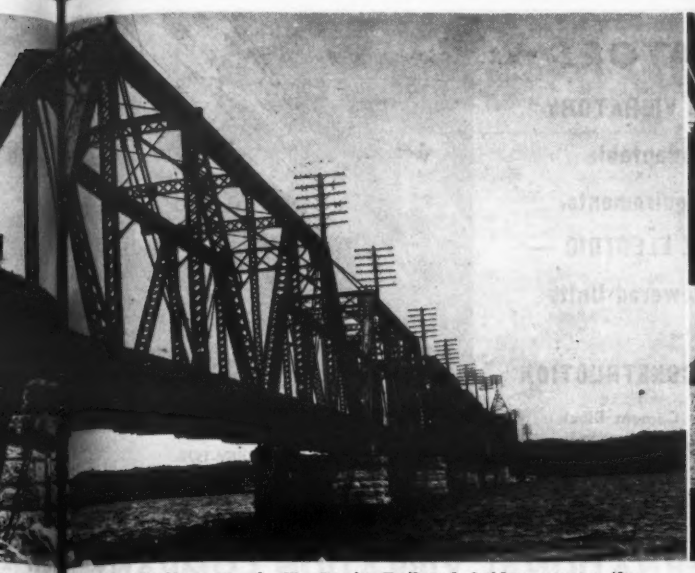


HYDRAULIC JACK. To raise the truss spans, eight 150-ton hydraulic jacks, four on each pair of barges, were used. Shown above is a close-up of one of them.



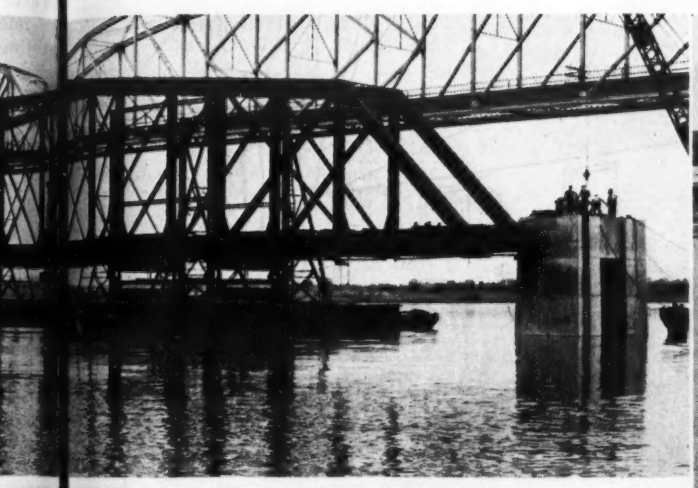


AFLOAT. The lift span on the way to its final position. The Nashville Bridge Co., Nashville, Tenn., contractor for constructing the new lift span as well as for moving the truss spans from the old bridge, used the same set of four barges for floating the three spans from the old bridge and the new lift span into position.

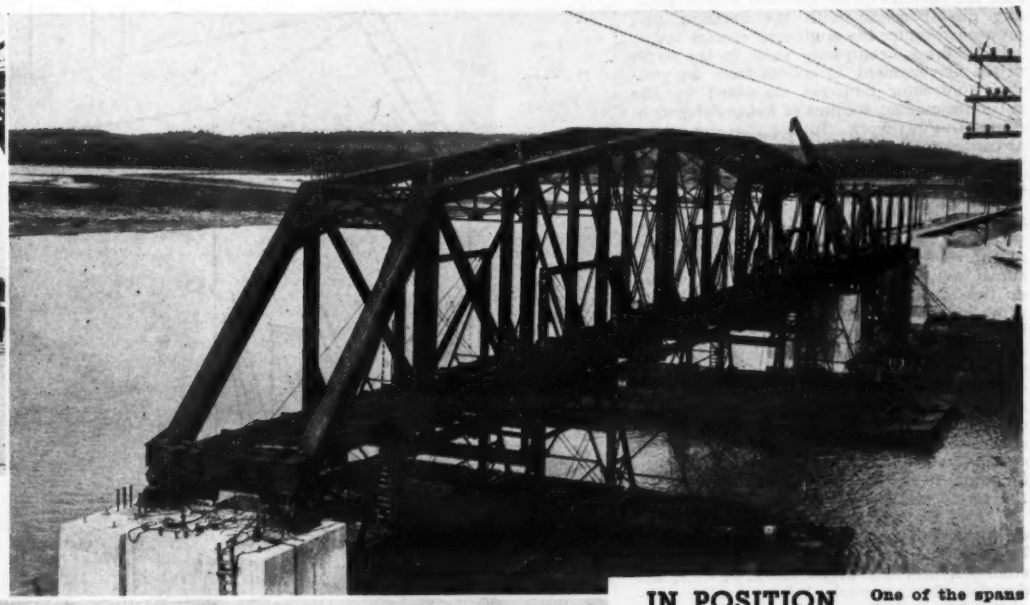


…shville, Chattanooga & St. Louis Railroad bridge across the …iver was inadequate, both in length and in vertical clearance, after …ley Authority's Kentucky Dam and the creation of 185-mile-long …Accordingly, a new structure had to be built.

OLD SPANS USED. For the new steel bridge, five truss spans of an old Illinois Central bridge no longer needed were used. Three of these were removed without dismantling and towed on pairs of barges 90 miles to the site of the new structure. Here the barges with their falsework are in position under one of the spans, prior to its removal.



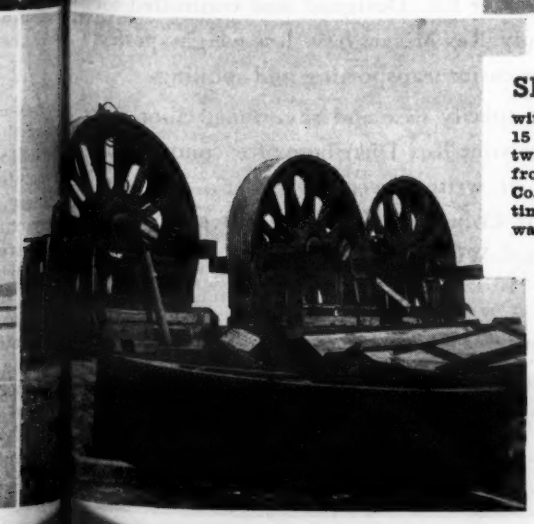
When the new location was reached, the truss was jacked up, the barges were eased into position by a 2-drum hoisting engine, and the truss span was lowered to rest on its piers.



IN POSITION. One of the spans is lowered into final position. It was necessary to raise the span 10½ feet to clear the shoes on the piers, and then lower it.

…ASSEMBLY. Two of the five spans from the old …ge were over land and therefore could …be moved intact by barge. These were …mantled from timber falsework, loaded …the barges, and towed to the shore at the …of the new bridge. Here falsework was …ted from the abutment on each side out …the piers, and the spans reassembled. A …log derrick lifted the steel into place, …re it was temporarily bolted for assembly, and then riveted.

NEW LIFT SPAN. Steel for the new 360-foot 1,600-ton truss lift span was shipped by barge from the Bethlehem Steel Co. plant in Pittsburgh to the bridge site and stockpiled along the river bank. Falsework for assembling the span was built out over the water so that the barges could be used for floating the lift span to its position in the bridge. Here is shown the 120-foot steel boom, mounted on two barges lashed together, placing the steel in the span during its assembly.



SHEAVES. Four giant sheaves raise the lift span with 2¼-inch cable. Weighing 27 tons, 15 feet 1¼ inches in diameter, with twelve grooves each, they were shipped from the Traylor Engineering & Mfg. Co. plant at Allentown, Pa., one at a time, on a specially built flat car which was blocked out in the center and had a width of 10 feet.

NEARING COMPLETION. Here, on the right, is the partially completed bridge, showing the spans in place and one of the lift-span towers under construction. Adjacent is a highway bridge. This new 1,637-foot railroad crossing of Kentucky Lake on the Tennessee River will be completed this autumn.

Avoid Legal Pitfalls.

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Main-Contract Provisions Binding on Subcontractor

It does not necessarily follow that, because a subcontractor has been delayed in performing his work through act or fault of the owner, the general contractor is liable to the subcontractor for resulting damages. The main contract may be so tied into the subcontract by the provisions of the latter that the general contractor is in the clear. The point is illustrated by a decision rendered by the United States District Court for the Eastern District of Arkansas (United States v. John Kerns Construction Co., 50 Fed. Supp. 692.)

Excavation operations under a subcontract on a Federal dam construction job developed conditions which moved the Government engineers to make certain changes in the work. The general contractor passed on to the engineers the subcontractor's claim for added time and extra pay because of the changes. The engineers allowed extra pay and the subcontractor did not then express any dissatisfaction with the decision, and proceeded under the engineers' change order.

Later the subcontractor sued, in the name of the Government, to collect from the general contractor damages sustained by the subcontractor on account of being delayed in completing his work. Ruling that the general contractor was not liable, because of certain provisions of the subcontract and the general contract, the court said:

"The plaintiff overlooks the fact that the subcontractor entered into a contract in which he assumed towards the contractor all of the obligations which the contractor assumed towards the owner, and that he would do the work 'in accordance with the terms, provisions, and conditions of the contract between the owner and the contractor * * * including all of the general and special conditions, drawings and specifications and other documents forming or by reference made a part of the contract between the contractor and owner, all of which shall be considered part of this subcontract by reference thereto and *the subcontractor agrees to be bound to the contractor and the owner by the terms and provisions thereof'*.

" * * * Every claim for allowance of time or increased costs made to the contractor by the subcontractor was duly filed with the engineer, properly urged for allowance, the decision thereon made known to the subcontractor, and the subcontractor invited to take an appeal"—to the proper Government department, as provided in the general contract—"but no appeals were taken. These changes and delays were not occasioned by the contractor, nor were they in contravention of the contract, but were made in conformity to and in compliance with the very terms of the contract and the subcontract."

The opinion cites two decisions of the United States Supreme Court in which identical contractual provisions were involved—United States v. Callahan Walker Construction Co. 317 U. S. 56, and United States v. Rice, 317 U. S. 61. In the latter case, the Court declared: "The delay here resulted from a change in specifications made necessary by discovery of soil unsuitable for foundation purposes. The Government having reserved the right to make such changes upon discovery of 'sub-surface and (or) latent conditions at the site materially differing from those shown on the drawings or indicated in the specifications,' delays incident to the permitted changes cannot amount to a breach of contract."

Liabilities Concerning Unguarded Excavations

Defendant city vacated part of a street for use by a Naval air station but the street was not closed and a motorist drove into an unguarded excavation which was concealed by the brow of an incline along which the street extended. The excavation was being done by a subcontractor under a general contract let by the Navy, and remained incomplete.

The motorist sued for damages, joining as defendants the city, the general contractor, and the subcontractor. The Minnesota Supreme Court decided that no ground for holding the general contractor liable was proved, but that, under the evidence produced at the trial, a jury could find that the city and the subcontractor were liable. (Mix v. City of Minneapolis, 18 N.W. 2d, 130.)

The court noted that there was nothing to show that the general contractor had "any control or right of supervision over the excavation area or over its subcontractor in the performance of his work". It did not appear that the general contractor had any right to possession of that area while the excavation was in progress.

As to the subcontractor, the court decided that the evidence would warrant a jury in finding that he should have foreseen that motorists would be likely unwittingly to trespass upon the vacated but unclosed portion of the street where the accident occurred. Being bound to foresee such trespass, the subcontractor was bound to erect suitable warning signs and barriers. The city was under like duty.

Who Was Employer?

The right of a worker's widow to sue in Pennsylvania for damages on account of his death depended upon whether the defendant was his employer for the purposes of applying the State Workmen's Compensation Law. The employee had been in the service of a subcontractor on a construction job, on which the defendant was doing other work. The accident was caused by negligence of an employee of the defendant. The wording of

(*Concluded on next page*)

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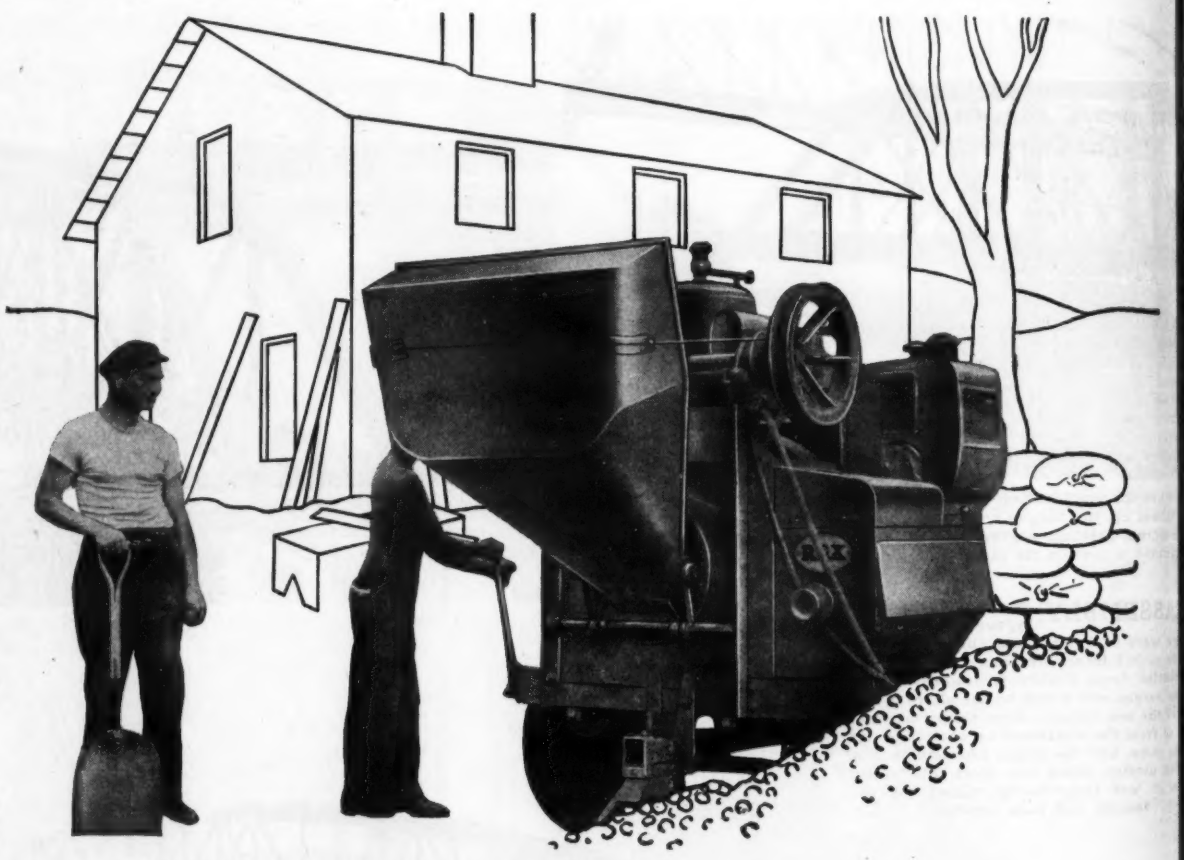

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REX CONSTRUCTION MACHINERY

Avoid Legal Pitfalls

(Continued from preceding page)

ertain agreements created some doubt as to the relationship of the fatally injured man to the defendant. However, the Pennsylvania Supreme Court ordered dismissal of the suit, thereby requiring the widow to resort to a claim under the Workmen's Compensation Act. The court was led to a conclusion that the workman was an employee of the defendant, within the meaning of that Act, because of these circumstances:

The defendant exercised control over the subcontract work, with the right to make changes, extend the time for performance, reject unsatisfactory work, and discharge any of the subcontractor's employees regarded as being incompetent, etc. The court said that a contrary conclusion was not necessitated by the fact that, under agreement with the defendant, the subcontractor carried workmen's compensation insurance on his employees. That fact might have relieved the defendant from liability to pay compensation for the injury involved in this case, but it did not necessarily render the defendant any the less an employer of the injured workman, for the purpose of determining whether the widow must seek recovery under the compensation act, rather than in a common-law action for damages. (Capozzoli v. Stone & Webster Engineering Corp., 42 Atl. 2d, [illegible])

Compensation Coverage For Out-of-State Injury

Finding that a construction employee was hired in Iowa to do work in Oklahoma, the Iowa Supreme Court has decided that the Iowa Workmen's Compensation Act covered a fatal injury sustained by the worker on the job in Oklahoma. (Haverly v. Union Construction Co., 18 N. W. 2d, 629.)

But two of the nine justices of the court dissented, being of the opinion that the employment contract was not made in Iowa, but in Oklahoma, the laws of which should govern. The dissenting judges said that on the facts of the case the employers had entered into a partnership in Iowa only for the purpose of the Oklahoma work, and that therefore this case should be distinguished from the ordinary case where a contractor has a permanently established general office in one state, which supervises jobs taken on in other states, and where resident employees are sent to the jobs under expectation of returning to the home state for assignment to other work.

The majority opinion gave effect to the fact that the injured employee had gone from Iowa, where an office having control over the job was located, without giving controlling effect to the fact that the partnership existed only for the purpose of doing the work in Oklahoma.

The appellate courts of the several states are not agreed whether, in the ordinary case where a permanent employer sends a permanent employee to another state to work, the compensation law of the home state governs. However, both recent legislation and court decision strengthen a well established policy in most of the states to apply that law, rather than the law of the state where the injury occurs.

Arbitration Agreement: Rights When It's Broken

Of course, the very purpose of arbitration agreements is to prevent litigation. Nevertheless they often breed it. Take, for example, a case lately decided by the Minnesota Supreme Court. The court ruled on twenty-one points of law, nine of which were concerned with the legal effect of an arbitration clause in a construction contract.

The clause provided for arbitration of disputes "at the choice of either party", and that an arbitrators' decision should be a prerequisite to a lawsuit. Dispute having arisen over the contractor's right to a certificate of final performance and as to the amount to which he was entitled, arbitrators were selected. But when the arbitration was about to get under way, the owners refused to proceed farther. Two days later the contractor sued to enforce a lien. Reviewing the trial court's decision on appeal, the Supreme Court laid down these rules of law as being generally applicable to broken arbitration agreements:

Such an agreement may be revocable or irrevocable, depending upon its wording. Arbitration may be waived by mutual agreement of the parties, expressed or implied. When the owners in this case withdrew from the arbitration, they waived it. The agreement having been revocable, the arbitrators had no right to proceed after the owners withdrew. That left a suit as the only means whereby the contractor could enforce his rights.

The rule is different in the case of an irrevocable agreement to withdraw, for in that case, on one party withdrawing the other has [illegible] he may have the arbitration proceed or he may sue, just as if there had been no arbitration agreement. But by choosing to sue, the aggrieved party waives all benefits that would accrue from arbitration. (Knutson v. Lasher, 18 N. W. 2d, 688.).

"Speak Now or Forever After Hold Your Peace"

Where a general contractor on a government airport job did not protest when a steam shovel used by the subcontractors did not come up to contract specifications, or when the subcontractors failed to keep some equipment free from liens, or when they failed to keep up to excavating schedules, these defaults were waived, and could not later be made an excuse for cancelling the subcontract. So decided the United States Circuit Court of Appeals, Second Circuit, in the case of United States v. Zara Contracting Co., 146 Fed. 2d, 606.

As to the delay in keeping up to excavating schedules, the court decided that the delay was excusable if due to the fact that clay subsoil was encountered in the face of a showing by the plans that the subsoil consisted of gravel, sand and silt. The excuse was particularly valid under a clause preventing the general contractor from terminating the subcontracts on account of delays due to unforeseen causes beyond the control of the subcontractors.

Arbitration Clause Covered Disputes

A contract to eliminate a railroad grade crossing provided that the engineer should decide all disputed questions of *fact* arising under the contract. Disregarding this clause, the contractor sued the railroad company for damages due (1) to delay of the company in furnishing possession of the site where the work was to be done, and (2) to interfering with the contractor's and the subcontractor's employment of labor by requiring use of more expensive and less competent labor. As to delay in furnishing the site, the contract provided that the contractor should be excused for delay caused by failure to induce the landowners to sell if prompt steps then should be taken to condemn.

The trial judge decided that it was the engineer, not the court, who should determine as a matter of fact, not law, whether the railroad company was at fault in belatedly furnishing possession of the site or in interferring with the employment of labor. The New Jersey Supreme Court upheld that decision (Anthony P. Miller, Inc., v. Pennsylvania-Reading Seashore Lines, 40 Atl. 2d, 290.)

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Pioneer Representative For Pacific Northwest

William Schannep, for the past 10 years associated with the Feenaughty Machinery Co., Portland, Oreg., has been appointed by the Pioneer Engineering Works, Inc., Minneapolis, Minn., as its District Representative in the Pacific Northwest. His territory includes Washington, Oregon, Idaho, western Montana, Alberta, and British Columbia, with headquarters at Seattle. Mr. Schannep was formerly with the Oregon State Highway Department, as well as with a construction equipment dealer. He has just finished six months of factory training to round out his experience in order to assist owners and operators of crushing, screening, and conveying equipment in that area.

A General Excavator Specification Folder

A uniquely arranged specification-bulletin folder on the General Type 10 Model 105 excavator, a ½-yard self-propelled rig, has just been released by General Excavator Co., 220 Rose St., Marion, Ohio. This machine, which combines the functions of shovel, crane, and dragline, was announced more than a year ago and has been undergoing a series of exhaustive road and operational tests.

The folder carries a series of detailed descriptions covering power flow, construction, and operation. Among the features of the Type 10 are: 20-mph highway speed; metered air control; fully independent travel, swing, and boom; optional 4-wheel drive; air-booster steering; heavy-duty engine, transmission, and clutches; four speeds forward and reverse; easily accessible assemblies; quick changeover to any front-end attachment; and many others.

Copies of these special folders are available to readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the manufacturer.

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The Airco Export Corp., 33 W. 42nd St., New York 18, N. Y., has been formed to conduct the export business of Air Reduction Co., Inc., Air Reduction Sales Co., National Carbide Corp., Wilson Welder & Metals Co., Inc., Puritan Carbonic, Inc., U. S. Industrial Chemicals, Inc., and other subsidiaries and associated companies.

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A Real Step Forward For Secondary Roads

Oregon Has Always Been Progressive in Caring for Its Market Roads; History From 1919 to Date

By OSCAR CUTLER, Assistant Staff Engineer, Oregon State Highway Commission

THE people of Oregon in 1919 voted a state tax of one mill on all taxable real property in the state each year, to be matched by the several counties for the purpose of constructing and maintaining a market road system. The improvement and maintenance of the roads included in the system were to a considerable extent under the supervision of the State Highway Department. Through the cooperative efforts of the Department and the county authorities, reasonable standards were adopted and approximately 5,000 miles of county roads were constructed. Many miles of these secondary highways and county roads, built from 15 to 20 years ago, when standards were lower, must be reconstructed to serve modern traffic. It is increasingly apparent that rural roads must be surfaced or treated with asphalt or road oils to eliminate the dust nuisance and provide smooth surfaces.

Part of the market road act was repealed by the Oregon legislature in 1931, the state levy of one mill being eliminated. However, the counties were still permitted to levy for market roads, and many continue to do so. These market road levies, together with general road and bridge millage taxes, plus refunds from state gasoline taxes and motor vehicle license fees, provide substantial sums. Also, during the war, the counties set aside reserves for road construction, and have plans for many miles of reconstruction when men, equipment, and materials are available.

The Secondary System

An Oregon legislative act in 1931 made provision for a state secondary system of highways, which is now an obligation of the State, and as a result the counties were relieved of the necessity of reconstructing and maintaining a considerable mileage of roads. At the present time, the Oregon state highway system is made up of approximately 4,800 miles of primary highways and 2,400 miles of secondary highways, while the county road system consists of 30,000 miles. Of the latter, 16,000 miles have been improved, some to good standards.

An Intensive Study

During the years 1936 and 1937, the Oregon State Highway Traffic Department, in cooperation with the Public Roads Administration, made a state-wide traffic survey and road inventory. One of the results of this survey and the assembled data was the publishing of Oregon State Highway Department Technical Bulletin No. 7, "The Economics of Highway Planning," from which it is possible within reasonable limits to determine the economic value of any highway or road, taking into consideration factors of costs, service and salvage values, income, benefits, and annual maintenance charges. Formulae derived from these factors permit the determination of a percentage of the relative benefit to the public of any state highway or county road.

In 1939 and 1940, an analysis of the relative benefits of approximately 15,000 miles of state highways and county roads was made. As a result, there was recommended to the Public Roads Administration and approved a Federal Aid secondary highway and feeder road system of approximately 1,150 miles. This approved system was approximately 25 per cent of the state's available allocation of mileage provided for in the Federal Act of June 16, 1936. A second recommendation approximating 25 per cent of the available mileage was ready for approval by the Public Roads Administration when war occurred, but was never submitted.

When funds became available for secondary highways and feeder roads by the terms of the Federal Act of 1936, the Oregon State Highway Commission, after consultation with the county officials, decided to provide the matching funds for the construction of the feeder roads on the county system approved by the Public Roads Administration, the counties being required to provide the right-of-way and maintain them. A considerable mileage of both state highways and county roads was constructed by funds re-

(Continued on next page)

Many miles of this type of road will be improved under Oregon's secondary-highway improvement program.

Big 2½ yard T7 TRAXCAVATOR grading new street in San Francisco

Loading sand at Portland, Maine . . . one of many tasks for this city's TRAXCAVATOR

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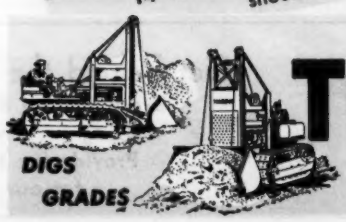

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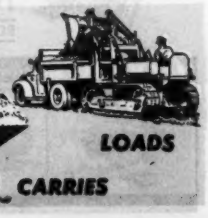

A Real Step Forward For Secondary Roads

(*Continued from preceding page*)

ceived under the provisions of this Act, construction being discontinued shortly after Pearl Harbor.

New F-A Secondary System

Soon after Congress adopted the Federal Aid Act of 1944, the Oregon State Highway Commission directed the State Highway Engineer to study the proposed Federal secondary highway system and to make an analysis of the roads in the Oregon highway system which are under the jurisdiction of the Commission, to review the county roads, which are under the authority of the county courts of the several counties, and to recommend to the Commission a system which would meet the requirements of the act and which could be constructed or reconstructed within a reasonable period of years. The Commission reaffirmed the policy of providing the matching funds and included the costs of additional right-of-ways required on those roads which are in the county system, the counties to maintain them and retain jurisdiction, with the maintenance by the counties performed under agreement with and to the satisfaction of the State and the Public Roads Administration.

Oregon highway acts and road laws permit the State to provide matching monies for county road improvement, and as the relations between the State Highway Commission and the county courts have always been very cordial the position taken by the Commission met with full approval.

The county courts and commissioners of the several counties in Oregon some years ago created an organization known as the Association of Oregon Counties, of which all counties are members. This organization functions through an elected president, vice president, and an executive board consisting of six members, who are also chairmen of districts consisting of six counties each.

As requested by the Highway Commission, the Engineer prepared a tentative system of Federal Aid secondary highways and roads and submitted it to the Highway Commission and executive board of the county association. The recommendation was based on the assumption that the present allocation of Federal funds could reasonably be expected to continue for a number of years, considering the necessity that exists for highway improvements, particularly for feeder roads, to provide adequate transportation, and that state revenues could be maintained at a level sufficient to provide matching funds. Consideration was also given to construction costs per mile to determine the number of miles that could be built within this period, with the anticipated revenues. The factors considered indicated that a system of approximately 5,000 miles could be recommended.

Considered next was the mileage of each classification of roads that should be recommended, as between roads now a part of the state highway system and county roads. Approximately 925 miles of state primary highways and 2,400 miles of state secondary highways are not in the Federal Aid high-

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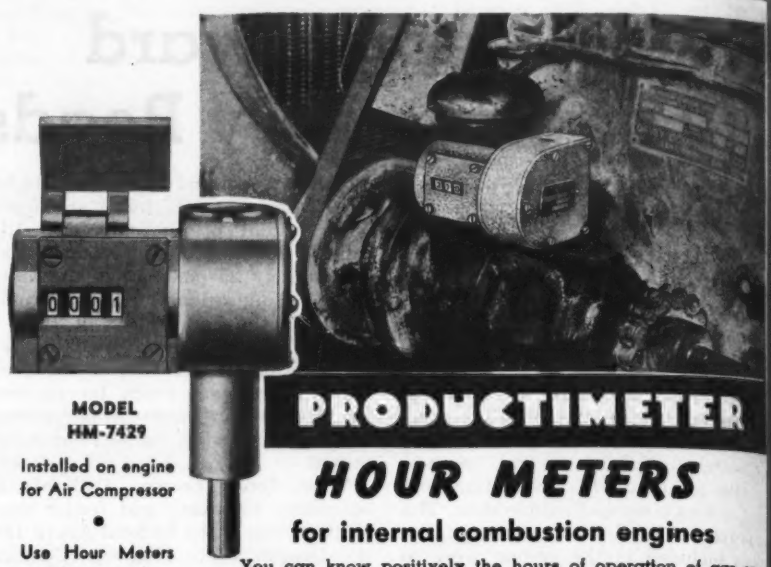

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Real Step Forward For Secondary Roads

(Continued from preceding page)

way system. These highways are of importance as they connect centers of population, serve rural areas and industrial centers, or form important connecting links with existing Federal Aid highways. The mileage of these state highways is not evenly distributed among the counties, so that to attempt to apportion the mileage of these roads to each county was not equitable. They were, therefore, considered separately, and an allocation of mileage of county roads to each county was considered upon the basis on which the Federal money is allocated to the states, that is, one-third rural population, one-third cost-road mileage, and one-third area. This formula provided a very reasonable distribution of county roads, as the counties in the eastern half of the state are large in area but sparsely settled, while in the western half of the state the county areas are smaller and the population greater.

As the total recommended system consists of approximately 5,000 miles, the mileage of county roads to be included is approximately 1,700 miles.

Over 5,000 Miles

The Highway Commission met with the county representatives, and this recommendation was unanimously approved. The individual counties were consulted and the local road problems discussed, and the county officials and the state Highway Engineer agreed upon the individual roads in each county, the roads selected being those which would serve the purposes contemplated in the Federal Act. The county officials adopted resolutions approving both the state highways and county roads proposed for inclusion, and the State Highway Commission has submitted to the Public Roads Administration for approval a system of 5,-000.88 miles.

An improved secondary road in Oregon.

Simplified Standards For Clay-Pipe Items

The simplified practice program of the clay-pipe industry has been declared operative by the U. S. Bureau of Standards, following a favorable vote by clay-pipe manufacturers, dealers, and all others concerned. The program went into effect immediately after the announcement of cancellation of WPB Order L-316, which first brought the many advantages of simplified practice to the clay-pipe industry as a wartime necessity.

The new program provides for approximately 500 standardized clay-pipe items to handle all clay-pipe needs, instead of the 1,500 to 1,600 items which were used before the war. The program is more lenient than the WPB limitation order, retaining all the advantages and eliminating hardships.

The program was developed through joint cooperation of the Division of Simplified Practice of the U. S. Department of Commerce and a committee elected to represent the clay-pipe industry, headed by W. E. Robinson, president of The Robinson Clay Product Co., Akron, Ohio. The simplified practice program is entirely voluntary and does not prevent producing and stocking "special" items. However, the new program makes a clean-cut demarkation between standard and "special" items and provides customers with a means of obtaining standardized stock from any manufacturer or dealer, since the entire industry will now produce standard items in common.

Variations and practices in different parts of the country have been taken into full consideration and special schedules of the program have been drawn up for the different geographical divisions. The program provides for production of both standard-strength and extra-strength clay pipe and fittings in the following sizes: 4, 6, 8, 10, 12, 15, 18, 21, 24, 27, 30, 33, and 36-inch.

A complete copy of the new simplified practice program can be obtained by anyone interested by writing to the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C.

The Mixer of Today

This is the title of a new 28-page catalog on the Jaeger line of concrete mixers in 3½-S, 6-S, 11-S, and 16-S units, as well as the 28-S plant mixer and the plaster-mortar mixer. The first four sizes are available as trailer, tilting, and non-tilting types, and all have heavy-duty construction and advanced features. Illustrations and text cover all the various models, as well as their distinctive features, and a check list at the back of the catalog makes possible comparisons with present equipment.

Copies of this new catalog may be secured by interested contractors and state and county highway engineers direct from the Jaeger Machine Co., 701 Dublin Ave., Columbus 16, Ohio.

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London's Waterloo Bridge Helps Repair Dutch Spans

Seven spans of London's old Waterloo Bridge, which was replaced by a new structure during the war, have been rushed to the Netherlands to aid in the reconstruction of several important railway bridges in that country. The longest of the Waterloo spans is 280 feet, the next, 150 feet, and the remaining five are about 135 feet.

One of the spans will be used to repair the Moerdijk Bridge, which is the longest and most famous span in the Netherlands. It is located south of Rotterdam and across it runs the railroad to southern Netherlands, Belgium, and France. Some 1,500 feet of the structure was demolished by the Germans last September.

The longest of the Waterloo spans will be used in repairing the Caterveer Bridge near Zwolle. This structure links the northeastern provinces with the main railroad networks to the west. Reconstruction officials have been using Bailey Bridges at some crossings, but these must be replaced by permanent structures as rapidly as possible. At least 70,000 tons of steel will be necessary to repair the bridges across the major streams dividing northern and southern Netherlands.

New Armco Bulletin to Aid Engineering Construction

Timed with the release of additional steel for culverts and other metal products used in the highway and heavy-construction fields, a new 60-page catalog entitled "Armco Products for Engineering Construction" has been issued by Armco Drainage & Metal Products, Inc., Middletown, Ohio. This useful catalog follows a new and convenient plan of listing some twenty-one drainage and related products for use in airports, flood-control, power and irrigation projects, highways, railways, sewage-treatment and water-supply plants, and other types of construction.

A series of bulletins concisely describes each product, lists its uses and features, and gives a reference to more detailed literature. Products of The American Rolling Mill Co. are also listed.

A free copy of this new bulletin may be secured by writing direct to Armco on your official letterhead and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

In a free competitive system, no worker, employer, merchant, or manufacturer can deviate far from the paths of justice and fairness and still prosper.

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MEDIUM Jobs—The Junior
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TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

Sand-Asphalt Mixed In Traveling Plants

Two Contracts Resurface Sections of Road to Beach; New Sand Fill Raises and Stabilizes Grade

THE heavily traveled road from Savannah running eastward to the sea at Tybee, Ga., where popular Savannah Beach is located, was improved this past summer in two different sections with a new surface of sand-asphalt pavement. Two separate contracts, totaling about 7 miles, covering the parts of the road most badly in need of reconstruction, were let by the State Highway Department. The remaining 13 miles of highway extending inland from the beach on the Atlantic, through a beautiful semi-tropical country, to the city line of Savannah is in a good state of preservation.

One contract covered 3,000 feet at the extreme eastern end of this resort highway, beginning at the western boundary of Tybee, and going through the town to where the road ends on the sands of Savannah Beach. Besides the road surfacing, this contract included the replacement of two narrow concrete bridges with 48-inch concrete pipe, but no work was done to the roadbed which was in fairly good shape.

The other contract was for a 6-mile stretch beginning 12 miles east of Savannah and extending towards the ocean, skipping a 2-mile gap which had recently been rebuilt. This section of road had subsided in several places so that at high tide it was not unusual to have 1½ feet of water covering these areas. Consequently this contract included raising and leveling the subbase with a sand fill averaging 3 feet in depth, and which in some places was as much as 5 feet.

This sand-asphalt surface is an economical type of pavement since it employs local sand from pits close to the road, and its flexible character is preferred where the highway is built over swamp land, thickly covered with subtropical vegetation, resulting in continual subsidence in varying degrees. Concrete pavements in such a region nearly always develop early cracks and have a tendency to sink and become uneven at the joints.

Both contractors used traveling plants to mix the asphalt and local sand, but on the first contract the plant was set up at the sand pit and the mix was hauled to the road in trucks, while on the longer contract the traveling plant mixed the sand-asphalt in place on the road.

Espy Contract

The 3,000 feet of pavement at the eastern end of the beach road was laid by the Espy Paving & Construction Co. of Savannah, Ga., during the month of May. The existing road, built in 1925, consisted of a 6-inch oyster-shell base, 20 feet wide, on top of which had been laid 1 inch of black-top plant-mix. During the past few years heavy military traffic broke up this surface severely, necessitating a new surface of sand-asphalt laid 20 feet wide on top of the old road for a compacted average depth of 4 inches.

Before any surfacing was done, the old pavement was given a tack coat of RC-2 asphalt, applied at the rate of 0.1 gallon to the square yard over the full road width by an Etnyre 1,050-gallon pressure distributor using a 20-foot spray bar. So that traffic could continue to use the road and not find the surface too slick for safe driving, this was immediately covered with a ¼ to ½-inch layer of sand-asphalt mix dumped from trucks and spread by a Caterpillar No. 12 power grader.

Mixing Plant

Because of the fairly short length of the project, a little less than a mile, the contractor decided it would be more economical to set up his traveling mixing plant at a permanent location in the sand borrow pit which was only ½ mile from the west end of the job, rather than mix the sand and asphalt in place on the road. Accordingly a Barber-Greene Travel Plant was jacked up at one end of a large sand pit on the south bank of the Savannah River.

The material from this pit is a fine grade of river sand, 100 per cent passing a No. 80 sieve, and well proportioned from the No. 80 down to No. 200 sieve size. A LeTourneau 7-yard scraper pulled by a Caterpillar RD7 tractor hauled sand an average of 50 feet to form a stockpile close to the plant. From this stockpile an International TD-40 tractor with a Bucyrus-Erie dozer pushed the sand to the feeder end of the plant whence it ascended the loader to the pugmill. Here it was mixed with RC-2 asphalt at the rate of 0.63 gallon to the cubic foot of loose sand. In this proportion every square yard of 4-inch compacted pavement contains 2.83 gallons of asphalt.

C. & E. M. Photo

On the Espy contract for 3,000 feet of sand-asphalt surfacing at Tybee, Ga., a Barber-Greene Travel Plant was set up in a sand pit to produce the mix.

The bituminous material was purchased from the Mexican Petroleum Corp. at its plant in Savannah and hauled the 22-mile distance to the pit in the contractor's 3,500-gallon Diamond T tank truck. This tank originally had a capacity of 4,000 gallons, but it was reduced to make room for the addition of two burners at the rear which kept the asphalt at a temperature of from 125 to 150 degrees F for use in the mixer. The pressure distributor was also used for transporting bitumen, together with a 1,075-gallon

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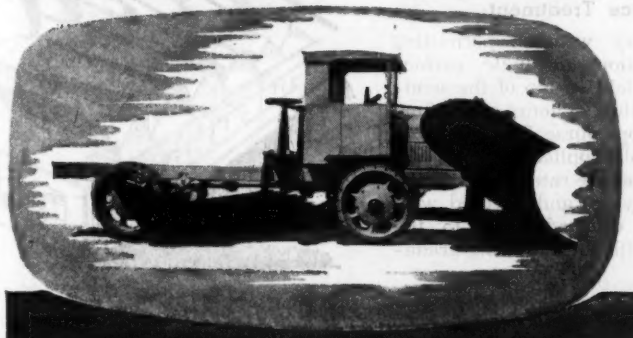
WALTER SNOW FIGHTERS



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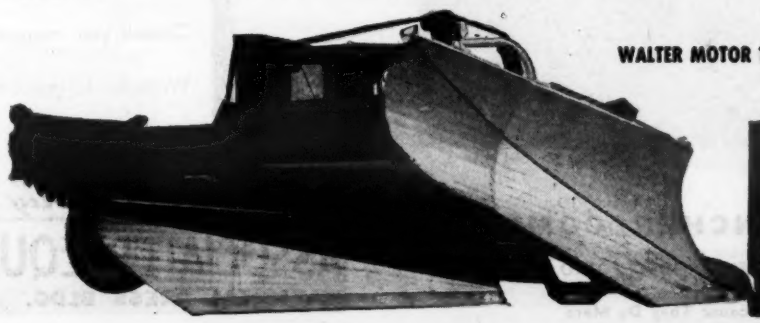

WALTER MOTOR TRUCK CO. 1001-19 Irving Ave., Ridgewood 27, L. I., N. Y.

WALTER SNOW FIGHTERS

Sand-Asphalt Mixed In Traveling Plants

(*Continued from preceding page*)

International tank truck. The asphalt was unloaded by the pump on the Barber-Greene plant, being piped direct to the 500-gallon storage tank on the plant from where it was sprayed in a steady stream on the sand as it entered the pugmill for mixing. In case any of the three heavily weighted asphalt transfer trucks became stuck in the sand as they maneuvered into position alongside the plant for unloading, an International TD-40 rubber-tired tractor was stationed at the sand pit to pull them out.

Mixing by the B-G Travel Plant was a continuous operation, with a cubic yard of material turned out every minute. The feed gearing was automatically regulated and the gate opening was set at 7 inches. If the water content of the sand was over 6 per cent, no mixing was permitted until the sand dried out.

Hauling and Placing

To transport the sand-asphalt mix to the road, four trucks with their drivers were hired by the hour from John B. Smith, hauling contractor of Savannah. Two of these trucks were 4-yard Internationals and the other two were 3-yard Macks which hauled the material an average of a mile and spot-dumped it in a 2½-yard pile every 14 feet down half the road. This amount of material, when spread full width and compacted, produced an even 2-inch layer, or half the required total depth.

After about ¼ mile of road was covered with these piles, the Caterpillar No. 12 power grader knocked them down and spread the material evenly over the full width of the road, and traffic was permitted over it for three to four hours. Next the grader scraped all the material into a windrow on one side of the road, then turned around and pushed it all to a windrow on the opposite side. The sand-asphalt mix was moved across the road at least six times in order to dry out the moisture and evaporate all the naphtha from the cut-back asphalt.

Finally the grader carefully shaped the mix to a 2-inch center crown after which it was rolled by a pneumatic-tire roller pulled by the rubber-tired International tractor, and rolled further by a Buffalo-Springfield 7-ton tandem steel-wheel roller. Traffic was permitted over the road during all these construction operations.

The bottom course was laid over the entire road and after a 48-hour wait the upper 2-inch layer was spread in the same way with the same equipment. For best results it has been found that the air temperature should be 80 degrees or over during the road-mixing and rolling operations.

Surface Treatment

With hot dry weather permitting sufficient aeration, a single surface treatment was laid on top of the sand-asphalt mix within 48 hours of the final rolling of the top course. This consisted of AC-15 asphalt, applied full width by the distributor at the rate of 0.40 gallon to the square yard, and covered with 42 pounds of crushed stone to the square yard, with the following gradation:

Sieve Size	Per Cent Passing
¾-inch	95–100
⅜-inch	0–15
No. 4	0–3

The stone was purchased from the Weston-Brooker Stone Co. at Camak, Ga., shipped by rail 110 miles to Savannah, and hauled the remainder of the distance to the project by trucks which laid the stone over the bituminous material through Buckeye tail-gate spreaders. Rolling was done by the tandem roller.

Quantities and Personnel

This 3,000 feet of pavement in Chatham County was laid at a cost of $9,800 and included the following major items:

Bituminous material	18,000 gals.
Sand	833 cu. yds.

A crew of 12 men was employed on this contract, with 7 working at the plant and the remaining 5 on the road. The plant force was made up of a foreman, mechanic, plant operator, tractor-scraper operator, tractor-dozer operator, and 2 laborers; on the road were

C. & E. M. Photo
R. K. Wright Contracting Co. used a Barber-Greene Travel Plant on its 6-mile contract east of Savannah, Ga.

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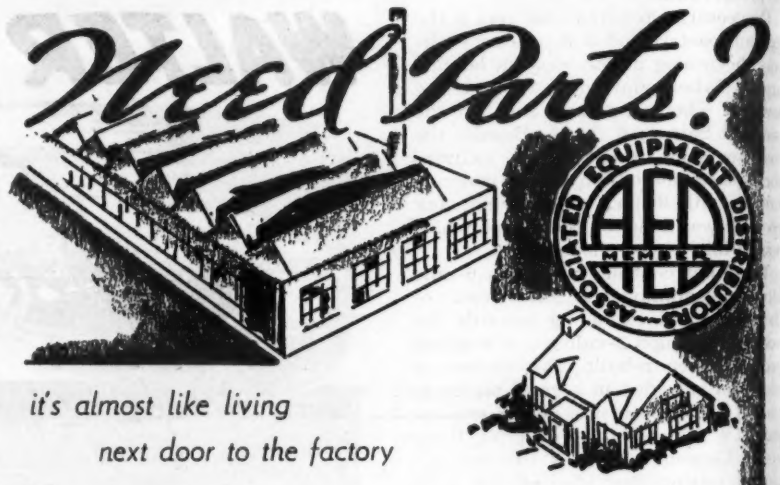

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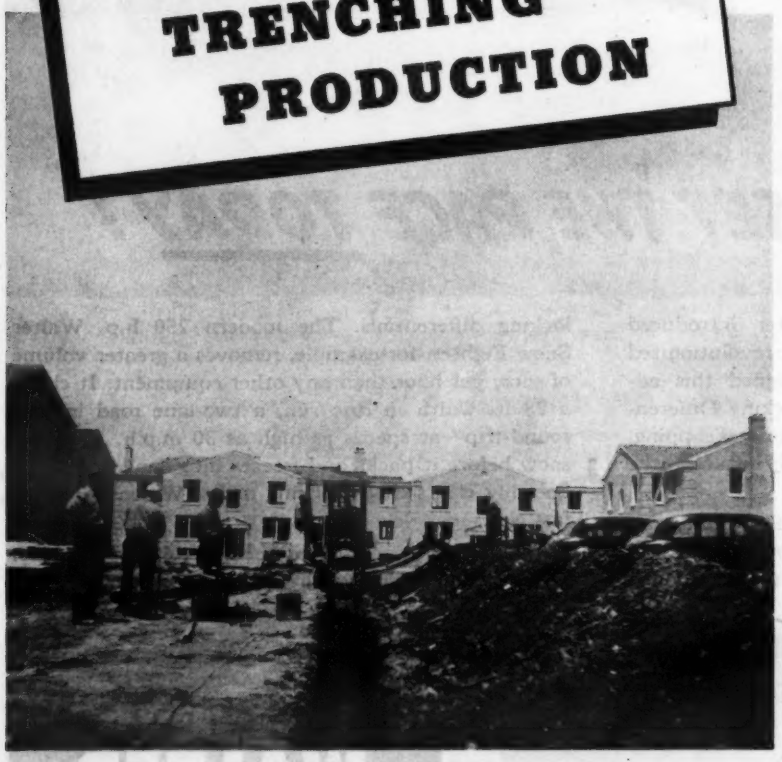

THE CLEVELAND TRENCHER COMPANY
20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO
"CLEVELANDS" Save More . . . Because They Do More

Sand-Asphalt Mixed In Traveling Plants

(*Continued from preceding page*)

grader operator, a roller man, a distributor operator and a driver, and a laborer for dumping trucks.

E. A. Stanley, former State Highway Engineer, is now General Superintendent for the Espy Paving & Construction Co. of Savannah, while J. B. Adams was Superintendent in direct charge of this project. For the State Highway Department of Georgia, J. R. Cook was Resident Engineer, assisted by W. W. Howington as Project Engineer.

The Wright Contract

The longer 6-mile contract, which also included considerable earth work, was awarded to the R. H. Wright Contracting Co. of Columbus, Ga., on its low bid of $265,000. Work was begun on the grading in October, 1944, and the road was completed in August of this year.

Similar to the other contract, this section of road had been built with a 6-inch compacted oyster-shell base which was covered with a single bituminous surface treatment, but the pavement width was only 17 feet with two 5-foot shoulders. The new roadway is considerably wider, with a 22-foot pavement flanked by 9-foot shoulders beyond which side slopes go down 4 on 1 to a bottom width of approximately 80 feet. The sand-asphalt pavement is a 6-inch compacted layer with a 2-inch crown.

Before any fill was placed, the old pavement was first plowed up in longitudinal furrows about 2 feet apart by a single-prong LeTourneau road ripper pulled by a Caterpillar D8 tractor. In one 1,500-foot section, where the new grade came within 1 foot of the top of the old road, the pavement was entirely removed by two Caterpillar D8 tractor-dozers which pushed the plowed-up bituminous surface off the side slopes as waste material. In the other areas where the pavement was not removed the tractors ran over the plowed material, pulverizing and flattening it.

Sand Fill

As traffic had to be maintained over this busy road with no detours available, these preliminary operations were quickly followed by the placing of the sand fill, all of which came from a single roadside borrow pit a mile to the west of the west end of the project. The sand was dug by an elevating grader and loaded into twelve 16-yard bottom-dump Euclids and five 12-yard wagons pulled by Caterpillar rubber-tired tractors. This rubber-tired earth-moving equipment hauled an average of 2,000 yards of sand in a 10-hour day at an approximate speed of 15 mph on an average haul of 4½ miles.

The sand was dumped in three piles spaced equidistant across the 40-foot roadway with the longitudinal spacing varying with the amount of fill being placed in different locations; this sand blanket ranged from 1 to 5 feet with the average depth of fill being 3 feet. The tractor-dozers spread the fill in 6-inch layers, their own heavy weight compacting the material, with a final rolling being given by a Bros pneumatic-tire roller pulled by an International rubber-tired tractor. By March 1, 1945, the fill was all completed, and by April 16 the weather had warmed sufficiently to permit the placing of the sand-asphalt pavement.

Traveling Plant Used

During the grading operations enough additional sand for the 6-inch sand-asphalt pavement was laid on the roadbed so that it had only to be scraped up and piled in a center windrow, 7 feet wide at the base and 2½ feet high, by a Caterpillar No. 12 grader. This windrow of sand, which had the same gradation as that used in the previous contract, contained 15 cubic feet in every linear foot, and was mixed with RC-1 asphalt at the rate of

(*Concluded on next page*)

Here's an all-purpose machine which makes short work of year 'round street, highway and airport maintenance jobs . . . jobs so varied it's hard to believe a single machine could handle them successfully. Equipped with a 9' scraper blade for light sub-grading, the Huber Maintainer can be converted speedily via practical attachments into a bulldozer, snow plow, mower, sweeper, lift loader or patch roller . . . has plenty of power at the drawbar for hauling, too. To get better acquainted with this one-man "maintenance crew," write today for a Huber Maintainer specification sheet.

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HUBER

3 WHEEL & TANDEM ROLLERS

YEAR 'ROUND MAINTAINER

Contribute to Unusual Performance

ROGERS TRAILERS are so designed as to carry 60% of the load on the rear unit and 40% on the tractor.

This provides the necessary traction—distributes the load properly over all tires — and greatly improves the haulability and brakeability of both tractor and trailer.

ROGERS BROTHERS CORP. ALBION, PENNA.

EXPERIENCE PERFORMANCE

★ If Victory Bonds aren't safe, no other investment matters. So buy Victory Bonds with every dollar you can find.

Sand-Asphalt Mixed In Traveling Plants

(*Continued from preceding page*)

10.1 gallons per linear foot of windrow. Mixing was done by a Barber-Greene Model 84 Travel Plant which moved at the rate of 4 feet per minute over the windrow, mixing from 1,200 to 1,400 feet of sand-asphalt for a 22-foot-width pavement in a 10-hour day.

Asphalt for the mix was purchased from the Mexican Petroleum Corp. plant in Savannah where it was heated to 125 degrees F by a Cleaver-Brooks tank-car heater, pumped from the tank cars to four International 1,000-gallon relay tank trucks, and hauled an average of 9 miles to the Travel Plant. These tank trucks supplying the mixer operated over half the road on one side of the windrow, while one-way traffic was maintained on the other side of the windrow. Only from ½ to ¾ mile of windrow was thrown up at a time, and this was mixed and placed before another windrow of the same length was made by pulling in material from both sides towards the center with the grader. In this way, inconvenience to traffic was kept at a minimum.

The tank trucks backed down the road, one at a time, to the Travel Plant, which had a 700-gallon storage tank, and when they were unloaded they returned to Savannah for another supply of asphalt. The transfer to the plant was done by the pump on the Barber-Greene machine.

Mixing

As the Travel Plant moved along picking up the whitish-colored sand and laying it out behind in a windrow of the same dimensions but black in color from the addition of the asphalt, the power grader followed along knocking down the windrow and leveling it off for the full 22-foot width of paving. The rubber-tired tractor then pulled an Oliver harrow, consisting of two rows of fifteen 22-inch-diameter disks, over the sand-asphalt mix to aerate the material and speed the evaporation of the naphtha from the asphalt. After two days of this processing, the loose mix was compacted by a sheepsfoot roller, then shaped to grade by the power grader, and rolled some more, first by a pneumatic-tire roller and then by a Buffalo-Springfield 5-ton tandem roller.

The 22-foot pavement was then given a single surface bituminous treatment similar to that in the previous contract. When the road was finished, oleander shrubs and palm trees were planted alternately in rows on both sides, 24 feet off the center line, at 25-foot intervals.

Quantities and Personnel

The major estimated quantities were:

Earth work	232,000 cu. yds.
Bituminous material	262,415 gals.
Coarse-aggregate cover material	1,500 tons

The R. H. Wright Contracting Co. of Columbus, Ga., employed a force of 15 men on this contract under the supervision of Lon C. Alexander, Superintendent. They included 2 flagmen on traffic maintenance, 3 mechanics, 4 tank-truck drivers, the Barber-Greene Travel Plant operator, 2 tractor operators, a grader operator and 2 laborers.

This work was located in Division 5 of the State Highway Department of Georgia of which D. D. Hankins is Division Engineer, and A. H. Long is Assistant Division Engineer. J. R. Cook was Resident Engineer on both projects. G. T. McDonald is State Highway Engineer of Georgia.

MALLDRILLS pack the wallop that counts in heavy construction or general maintenance work . . .

★ Rugged construction for long, hard, continuous drilling of metal, plastics and wood.

★ Special steel alloy gears and self-lubricating bearings assure increased speed, cool operation, and prolonged service.

★ Light weight and compact design reduce worker fatigue. Also add to adaptability of drills.

★ Easily serviced—commutator can be inspected and brushes replaced without dismantling drill.

★ ¼" model available in 2 speeds 2500 or 1700 r.p.m.; ½" model available in 500 r.p.m. Both operate on 110-volt A.C. or D.C., or 220-volt A.C. or D.C.

Ask your distributor for MallDrills, MallSaws, Mall Concrete Vibrators and Mall Chain Saws or write direct for literature and prices.

MALL TOOL COMPANY

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Offices in Principal Cities

"Walk It" OVER THE FILL...

And You'll Know Why This Tamper is Preferred!

"TAKE IT FOR A WALK" over the fill! Test its easy holding —its faster operation. Then you'll know why the Gardner-Denver Backfill Tamper is a favorite with operators . . . and why it gets more tamping done in shorter time!

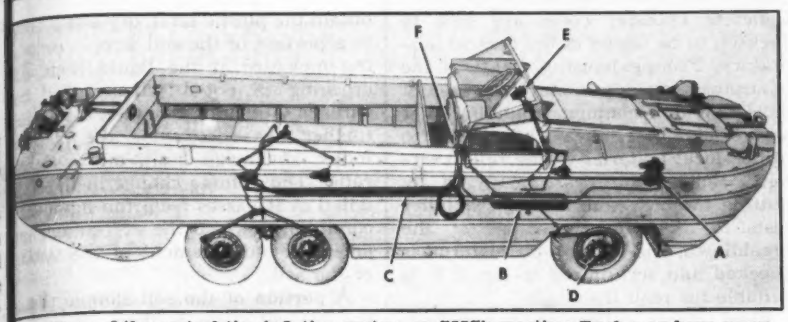
Here's a Backfill Tamper that's *new* in design . . . built to operate efficiently in *any weather* . . . sturdy and rugged to stay on the job through long years of service. Speed your operations with this better tool. For complete information, write Gardner-Denver Company, Quincy, Illinois.

- Stays on the job—no frequent packing of gland required.
- Reduces operator fatigue—speeds operation.
- No freezing of valve or exhaust in cold, damp weather.
- Integral oil reservoir assures complete lubrication of all working parts.
- Low lift, end-feeding type valve assures sustained efficiency of piston action.
- Cylinder bore specially burnished for greater wear resistance.
- Tamping pad securely held by double taper locking features.

USE COMPRESSED AIR FOR SAFETY CONVENIENCE FLEXIBILITY

GARDNER-DENVER *Since 1859*

Give Generously to YOUR COMMUNITY WAR FUND



The set-up of the central tire-inflation system on GMC's wartime Duck may have many applications on post-war equipment and vehicles.

Duck" Tire Inflation Has Post-War Uses

Already a number of manufacturers of commercial vehicles and tire men see possibilities in the application of the central tire-inflation scheme of the war-famous GMC Duck to post-war vehicles. Through this unique development, over or under-inflation of tires is held to a minimum, and tire pressures may be adjusted en route to give the vehicle maximum performance on all types of terrain.

The essential units of the central tire-inflation system as shown on the accompanying illustration are: (A) an air-compressor pump, located towards the front of the engine, and running constantly with it; (B) a compressed-air storage tank; (C) air lines from the air reservoir to the wheels; (D) rotating pressure joints attached to each wheel hub; (E) a tire-pressure gage and inflation-control lever on the instrument board; and (F) control valves for each of the six air lines carrying air to the tires.

The crux of this system is the specially designed hub device. Actually, it is not a hub but a rotating pressure joint which is attached to the wheel hub by means of special studs and set screws. The inner or rotating member turns with the wheel while the outer or stationary member is restrained from turning by a flexible strut arm attached to the body of the vehicle. The air hose connecting the air line and the hub is carried within and protected by the strut arm. Within the rotating joint is an air seal located at the point where the hardened-steel nose piece of the rotating member is in contact with the plastic disk of the outer or stationary member. By accurate grinding of the nose piece and a fine adjustment of the plastic disk, an air-tight seal is obtained. A special precision heavy-duty ball bearing maintains close alignment between the two members and insures long life for both the joint and the air seal.

Manufacturers and others who see possibilities in the application of this tire-inflation system to their equipment should get in touch with the GMC Truck & Coach Division, General Motors Corp., Pontiac, Mich.

Earth-Moving Equipment For Wide Variety of Jobs

A complete line of high-speed rubber-tired earth-moving, hauling, and lifting equipment is described and illustrated in a 12-page catalog recently issued by R. G. LeTourneau, Inc., Peoria 1, Ill. Rubber-tired prime movers specially designed for high-speed earth-moving, scrapers for use with wheel-mounted or crawler tractors, cranes, bulldozers, and sheepsfoot rollers are included, all featuring welded construction for maximum strength with minimum weight. The catalog is profusely illustrated and gives complete specifications for all the equipment described.

Interested contractors and highway engineers can secure copies of Catalog No. G-1066 upon written request to the manufacturer and mention of CONTRACTORS AND ENGINEERS MONTHLY.

Dealers Get Preview Of New Koehring Line

At a sales school held recently in Milwaukee, representatives of the distributor organization of the Koehring Co. of that city were given a preview of the Koehring peacetime line of heavy-duty construction equipment. Complete machines as well as major parts and assemblies, completely accessible and readily studied at leisure, were located at stations around a large circus tent and in a canvas-walled "side show" section.

Included were new post-war Koehring 205 and 605 shovels, the self-powered Cruiser Crane, and the new Available mounting for the line of Koehring truck cranes. There were also a Koehring paver and Longitudinal Finisher, Kwik-Mix concrete mixers, a Johnson batcher and streamlined clamshell buckets, the latest Koehring Dumptor, the recently announced Parsons 200 wheel-type Trenchliner, and the new arched-frame 221 ladder-type Trenchliner. The standard Mud-Jack and the new revolutionary railroad-type Mud-Jack, which is specially designed to stabilize ballast and eliminate continuous maintenance operations where "soft" track conditions exist, were also on view.

This preview and training course for sales engineering and service were handled by a group of expert instructors, each assigned to a particular unit or assembly. Those attending were divided into small groups, so that each individual could secure maximum benefit from the instruction. The purpose of this meeting was not only to provide a preview of the Koehring equipment available for this country's vast post-war construction program but also to insure that the Koehring distributor organization is equipped to provide complete engineering advice and service to its customers.

ROAD BROOMS
BOTH LITTLEFORD BROOMS ARE TWO-WAY BROOMS
Before applying asphalt, tar, emulsion, road oil, or cut-back to our highways, the Littleford Road Broom sweeps away the dust and dirt so that the bituminous material can make a perfect bond with the road surface.
Any desired pressure of the Broom can be applied to the road surface due to the Hydraulic Lifting Arrangement which allows the Broom to be raised or lowered to give the proper tension.
Littleford Road Brooms are made in two models—Model No. 106 Traction Driven Broom and Model No. 108 Power Driven Broom. Both models can sweep either to the right or left and can be changed from one position to the other in less than two minutes' time.
Littleford Road Brooms are the answer to better constructed roads.
MODEL NO. 108
POWER DRIVEN BROOM
MODEL NO. 106
TRACTION DRIVEN BROOM
Hydraulic Lift raises and lowers the Broom and adjusts the Broom tension on the road surface.
BLACK TOP ROAD MAINTENANCE EQUIPMENT
LB
SINCE - 1900
LITTLEFORD
485 E. Pearl St.
LITTLEFORD BROS., INC.
Cincinnati 2, Ohio

Testing Laboratory For Highway District

Shops, Garage, and Lab Serve One-Third of State, 2,380 of 6,500 Miles of State Highway System

✦ THE northern district of the Mississippi State Highway Department comprises 31 counties and approximately 2,380 of the 6,500 miles in the entire state highway system covering 82 counties. Headquarters for this district, No. 3, is located at Houston in the northeast corner of the state, where the main district garage, shops, and soils and materials-testing laboratory are situated. The state is divided into three districts, north, central and south, each of which contains about the same geographical area and road mileage, with headquarters for the central district at Newton, and for the southern district at Hattiesburg. The general offices of the Mississippi State Highway Department are located at Jackson, the state capital.

Besides its main garage and maintenance plant at Houston, the northern district also has smaller shops at Tupelo and Sardis, headquarters for the first and second maintenance divisions of the district, but heavy repairs for the district and repairs for its fourth maintenance division are taken care of at Houston.

The Houston district shops and laboratory are enclosed by an 8-foot wire fence in an area 400 feet square close to Miss. 8 and adjacent to a siding of the Gulf, Mobile & Ohio railroad. Gates in the north and east sides of the wire-fence enclosure give access to the shop yard and the main repair garage, which has a 30-foot front along the north fence and a depth of 110 feet extending to the south. In 1940, state maintenance forces erected four buildings on the site, including the main shop, laboratory, storage shed, and oil house where, before the war, an average of fifty-five were employed, fifteen in the shop and thirty in the laboratory. At the present time the shop personnel has been reduced to seven, a foreman, clerk, and five mechanics, who have been hard pressed to maintain constantly failing equipment, while only ten have been at work in the laboratory since the wartime lack of highway construction and maintenance operations eliminated the need for field crews usually employed in soil-testing work.

Testing Laboratory

The laboratory occupies a 30 x 60-foot wooden building located 12 feet off the west fence line and is used primarily for testing soils, but also analyzes bituminous materials, sand, gravel, and other aggregates used in this district. Concrete cylinder cores are sent to Jackson to be tested in the central laboratory. From exhaustive soil tests, the laboratory can determine what type of pavement to recommend building over a particular base, always attempting to utilize local material to the fullest extent. Road failures are analyzed by putting the base soils through stability tests to ascertain the cause of the breakdown, and borrow-pit material is checked and scrutinized to see if it is suitable for road use.

Field crews collect in paper bags samples of the soil taken every 100 feet along the center line of a road, from the top layer to 3 feet below the grade. These samples are brought to the soils preparation room where the material is dried in electric ovens for 24 to 48 hours, after which a portion of the soil is pulverized with mortar and pestle until it will pass a No. 40 sieve. U. S.-standard sieves are used for all soil tests in the Houston laboratory. The liquid limit of this specimen is then determined on a liquid-limit machine. To obtain the plastic limit, dry soil is added to a portion of the soil sample containing moisture at the liquid limit until cracking is noted when rolled into threads ⅛ inch in diameter, after which further tests determine the plasticity index, shrinkage limit, and shrinkage ratio. The volume change in the soil is noted as it passes from the liquid-limit condition down to the dry state, giving an index measurement of the stability of the soil.

A portion of the soil sample passing the No. 40 sieve is then placed in a Gooch crucible, saturated with water, hung in a humidifier, and allowed to drain for 12 hours, after which it is removed and placed in a centrifuge for one hour. The specimen is then weighed, dried in an electric drying oven, and reweighed on a balance to determine the measure of the capillarity of the soil.

In the meantime, another portion of this soil is ground to pass a No. 10 sieve and 100 grams is weighed out, saturated

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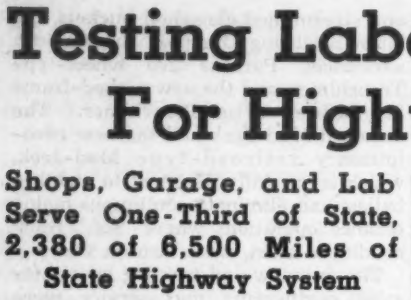

Junior RAPID PAVEMENT CONCRETE BREAKER

Fastest Pneumatic Method
Cuts Cost and Time
Works Inside or Out
Good for all Small Jobs

Ask about our
HEAVY-DUTY TYPE

RAPID PAVEMENT BREAKER COMPANY
1547 Santa Fe Avenue, Los Angeles 21, Calif.

HOW A B-G MAINTENANCE PLANT PUTS *QUALITY* INTO SHORT SURFACING JOBS

A B-G Portable Maintenance Plant with Dust Collector.

Where a permanent set-up is desired, equipment is furnished without running gear. Mixer can be used as separate unit when desired. Plant produces all types of bituminous material—hot, cold, sand, sheet, powdered and emulsion mixtures.

You get the same proportioning, mixing and drying control with this Barber-Greene Maintenance Mixer and Companion Dryer that has made the B-G Heavy Duty Asphalt Plant famous the country over for its accuracy and homogeneity of mix.

With the B-G Maintenance Plant you can economically produce the highest quality bituminous mix for short street and highway jobs, for patching, and for surfacing driveways, parking lots and other small areas.

Dryer and mixer are self-contained mobile units, quickly uncoupled and trailed from one location to another. Speedy, easy erection reduces unproductive hours when changing sites ... steps up monthly tonnages ... requires a minimum maintenance crew.

Add up the advantages of the B-G Maintenance Plant with its "continuous flow" capacity of 15 to 30 tons an hour ... its thoroughly controlled mixing ... its extreme portability and flexibility, and you'll find where huge savings are effected in time and money over the years in patching, putting down short stretches and handling small blacktop paving jobs. Barber-Greene Company, Aurora, Illinois.

Barber-Greene B G Constant Flow Equipment

Testing Laboratory For Highway District

(Continued from preceding page)

with water, and allowed to stand overnight. Sodium silicate is added as a dispersal agent and the soil is placed in a baffle cup and dispersed by an electric mixing machine. The specimen is next put into a cylinder while enough water is added to make a volume of one liter. By the Bouyoucos hydrometer method, the amounts of silt, sand, and clay in the soil are determined. The sand is then collected by washing the soil over a No. 200 sieve after which it is dried and screened on an electric shaker machine to get its gradation.

After the complete analysis of the soil, the data are recorded on charts and the specimens are classified in groups from A-1 to A-8, according to the U. S. Public Roads Administration classification. The soil is further tested for maximum Proctor density and optimum moisture, and also for fertility in the growth of sod and the possibility of erosion.

The information obtained from these tests is then laid out on profile sheets, a set of which is given to each project engineer on a construction job. Besides the group classification of the soil at 100-foot intervals, these data contain the physical characteristics of the soil, including the liquid limit, plastic limit, plasticity index, shrinkage limit, shrinkage ratio, centrifuge moisture equivalent, field moisture equivalent, and volume change. The profile also shows the mechanical analysis of the soil, with the proportions of material retained on sieves Nos. 10, 40, 60, 270, and the silt, clay, and dust ratios.

Main Shop

The main shop building at Houston has corrugated-metal sides and roof supported on wood trusses and columns, with a concrete foundation floor. Sash windows on all sides of the building furnish natural light. Two rows of electric bulbs extend the length of the building at 10-foot intervals. Access is gained by four large sliding doors, 14 feet high x 12 feet wide, two of which are located in the east wall, one in the west, and the fourth in the rear or south wall. Post-war plans have this building slated for enlargement and improvement.

Across the north end of the building, partitioned off from the rest of the shop, is the office and stock room which is heated in cold weather by a metal stove. At the west side of this room is a 12 x 14-foot enclosure where tires and tubes are carefully guarded. As the fourth maintenance division of the district issued only two new tubes during the war, most of the rubber has received plenty of patching. South of the tire storage area is a wash room with shower and lavatory.

A door in the partition leads into the shop where, down the center, engines are repaired on three tables, 5 x 4 x 3 feet high, made of angle irons with wooden tops. Beneath the top of each of these solidly built tables is a shelf on which parts and tools are kept ready for use. Down each side of the shop, suspended from the wooden trusses, is a steel beam acting as a track for another beam with rollers, on which is mounted a 2-ton chain hoist which can be moved as desired to any spot where lifting is needed.

On each side of the building are compressed-air outlets connected to a compressor, located in the northeast corner, which is driven by a 1½-hp electric motor. Also in the north end of the shop are a 16-inch lathe with an 8-foot bed, and a 20-inch drill press, both on a belt drive operated by a 3-hp motor located on an overhead rack. Nearby is a 10-ton hydraulic press. Along the west wall at the north end of the shop is a 3 x 10-foot work bench with a metal top which holds a bench grinder and a valve refacer.

Shop equipment also includes a valve-seat grinder and a boring bar for boring cylinders but, without a grinding machine, crankshafts must be sent to a commercial machine shop for grinding. South of the door, along the west wall, is a metal-topped work bench, 3 x 30 feet, equipped with a 6-inch bench vise at each end and with cabinets beneath for tool storage. At the north end of the bench is a riveting machine used in relining brakes, while at the other end is a 4½-foot-square blacksmith forge with a hand blower and a 100-pound anvil.

Along the east wall at the north end of the shop is a 6 x 3-foot metal-top work bench on which is located a grinder, while on one side of the bench is a battery charger. In the southeast corner is a tank, 4 x 2½ x 2 feet deep,

(Concluded on next page)

Heavy-duty tires and earth-moving equipment played an important part in the preparation of the site and construction of access highways to the government reservation of Oak Ridge, near Knoxville, Tenn., where much of the development and production of the atomic bomb was carried out. Here a Link-Belt Speeder is loading a bottom-dump Euclid equipped with 21.00 x 24 Goodyear Sure Grip tires with dirt during the construction of 23 miles of the access highway between Knoxville and Oak Ridge.

Here is the handiest time-and-trouble-saving piece of equipment you can have around for maintenance, service and special jobs—any place that you may need 50 to 200 tons of easily portable hydraulic power.

The Rodgers Universal Press is the ideal answer for pulling gears, pinions and wheels: for pressing shafts, bushings and pins; for clamping and jacking operations. It is used on a stand as an ordinary press, or on its side horizontally. Tie rods are quickly disassembled to fit the press around a large piece of equipment and they may be lengthened with extension rods. Frame may be used in full or narrow width—cylinder is mounted either between upper frame members or suspended below. Tested special alloy steel assures great strength for safety and ruggedness. Power is supplied by either the Rodgers 4-speed Hand Pump or power-operated pump unit.

A Rodgers Universal will pay for itself over and over in the time and labor it will save you—we believe you will find it almost indispensable. *Write now* and let us send you all of the facts.

Send for this interesting booklet . . .

It will give you complete information and details about Rodgers Hydraulic Presses. No obligation, of course, and you can profit by it.

Rodgers Hydraulic, Inc.

hydraulic power equipment

7415 Walker St., St. Louis Park, Minneapolis 16, Minn.

Testing Laboratory For Highway District

(*Continued from preceding page*)

in which radiators are tested for leaks. Nearby is a floor jack on which trucks are raised for greasing and repairs. Painting is also done here with spray guns.

Rolling equipment for all-around usage includes a portable tank-car heater which is kept in the garage through the winter for use in cleaning motors, and in the summer during bituminous operations it heats asphalt or tar for unloading from tank cars in the yard. Welding is done either with an electric arc welder mounted on a truck so that it can be taken out on the road to repair broken equipment, or with an oxy-acetylene outfit.

The Yard

Outside the east door of the shop is a gas pump for fueling equipment, across from which is a 20 x 30-foot oil house which has a ramp for greasing. South of the oil house along the east fence line are four wooden bins, 30 x 15 x 5 feet high, used for storing stone aggregate for road work. A spur track from the G. M. & O. railroad, which parallels the fence at a distance of 150 feet, services these bins, with the cars being unloaded across the fence by a crane and clamshell. Not far from the bins is a 30,000-gallon tank which holds asphalt when patching or seal coating is being applied to the roads. A semi-portable asphalt plant is being set up in the yard for road-surfacing operations. In the southwest corner of the lot is a wooden shed, 16 x 130 feet, used for storage.

The chief safeguard against fire at the Houston shops is a watchman, always on duty, who must punch six different station clocks in the course of his rounds. No insurance can be carried on state property, according to Mississippi law, so these periodic inspections are of great importance. Portable hand fire extinguishers are located throughout the buildings.

A total of 127 units are maintained at Houston, the larger items of which are: 35 trucks, 15 tractors, 4 passenger cars, 8 power graders, 3 scrapers of 6-yard capacity, 2 truck trailers, 3 rollers, a dragline, an asphalt plant, a pile driver, and 5 power mowers.

Personnel

District 3 (Northern) of the Mississippi State Highway Department operates, as do Districts 1 and 2, under the supervision of the Highway Department office at Jackson, of which J. D. Monette is Acting Chief Engineer. The activities of District 3 are supervised by S. S. Holder, District Construction Engineer; J. Barry Brown and W. A. Birdsong, Assistant District Construction Engineers; L. D. Ritter, District Testing Engineer; W. E. York, District Maintenance Engineer; and Frank Worsham, H. C. Ford, and Thomas G. Salmon, Assistant District Maintenance Engineers. In addition, there are nine Maintenance Superintendents directly in charge of maintenance details.

Moore Equipment Buys Two California Companies

Announcement has been made by the Moore Equipment Co., Stockton, Calif., of the purchase of the Norris K. Davis Co. and the Snow Removal Equipment Co., of San Francisco. This purchase is in line with the company's expansion in the manufacture of its own construction equipment for distribution in the thirteen western states, as well as providing a suitable location in the Bay area for the distribution of the many lines of contractors' equipment handled by this company as dealer.

The San Francisco property makes available sales rooms and service facilities in that city in addition to the main manufacturing and service plant at Stockton. This expansion, together with its experience in the production of many million dollars' worth of materials for the armed forces, will make it possible to render a complete combination of services to contractors in the Pacific Coast area.

New Condensed Catalog On Transits and Levels

An up-to-the-minute condensed catalog containing a description of the principal Gurley surveying and recording instruments, including precise and contractors' transits, wye and dumpy levels, alidades and plane table outfits, water-level recorders and current meters, has just been issued by W. & L. E. Gurley, Troy, N. Y. Copies of this convenient-sized Bulletin No. 50 may be secured direct from Gurley by mentioning this review.

STAY IN THE LEAD

By using the

HI-WAY MODEL R MATERIAL SPREADER

Reversible transmission on both the feed roller and agitator permits changing from forward to reverse motion, or vice versa, by simply shifting a lever.

The Swivel-type Adjustable Hitch allows the Traction Wheels of the Spreader to be on the Ground at all Times regardless of what position the truck or spreader is in. Easily coupled and uncoupled.

Disengaging lever for coupling and uncoupling is extended to the outside of the spreader, eliminating danger for the operator.

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Harbor Excavation In Hard Coral Rock

Seabees Move 551,619 Yards in Four Months; Clamshell Performance On Tough Assignment

By R. P. DAY, CCM, USNR

BARGE-MOUNTED cranes with clamshell buckets, dredging in hard coral did a "rush" job in the Palau Islands of the western Pacific, even while Jap snipers were active in some parts of the area. In four months' time, 551,619 cubic yards of hard coral was removed, requiring 524 tons of industrial explosives. The work was pushed through by a 180-man echelon of Seabees of the 301st U. S. Naval Construction Battalion. Dirt movers, powdermen, machine operators, and demolition experts went along. They brought back some of the most accurate facts on the performance of standard 2½-cubic-yard clamshells which have thus far come out of the war.

It was a 1A-doubled job. Commitments were made regarding time, and there was no turning back. Ten days after one job began, heavily loaded oil barges and LCT's began using work that was hardly finished. Viewed as a whole, it was a channel and boat-basin development, subdivided as follows:

Job "A": An outer harbor, protected on two sides by natural coral barrier reefs rising 10 feet above low tide, on one side by the beach, and by a string of pontoons on the seaward side, was deepened. An entrance channel 125 feet wide was blasted and dug through one of the coral barriers. The outer harbor was connected also with a small-boat basin by means of a narrow channel dredged by the clams. To complete this work, 55,000 cubic yards of coral had to be excavated.

Job "B": An entrance channel and a small-boat basin had to be cut in a coral reef at the southerly end of the island on which the work was being done. The minus 15-foot contour line on this reef was parallel to the shoreline and about 2,200 feet seaward. About 2,000 feet of the reef was awash at low tide. The project called for 360,860 cubic yards to be removed in order to create a 120-foot entrance channel to minus 10, referred to mean low tide, and the contruction of a small-boat basin 300 feet wide x 900 feet long. The boat basin was excavated to a depth of minus 8. On this job, loaded craft began congesting the work site almost as soon as it started, and much of the matériel that was unloaded on this island to help finish the fighting came in through the channel the Seabees built.

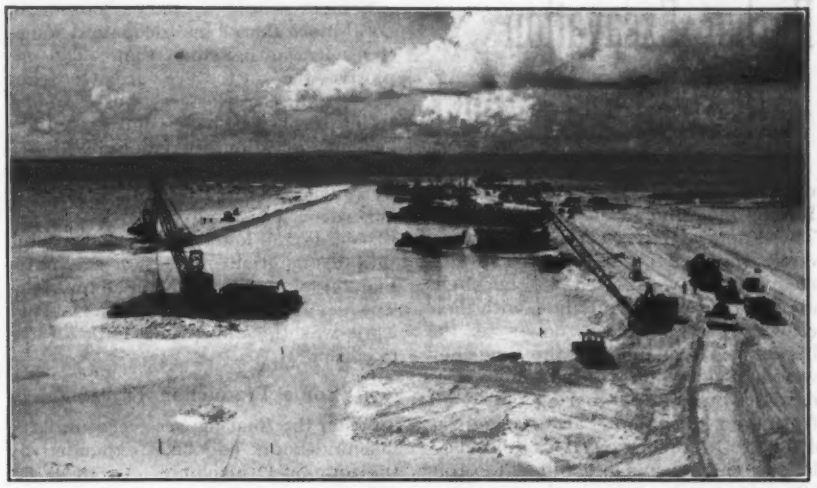
Job "C": A coral reef 3,380 feet wide, submerged 2 feet at low tide, was crossed by a 100-foot channel. Dredging was carried to minus 7, and the excavated material was cast along both sides of the cut. Swift currents, set up by tidal action after the channel was finished, are expected to keep it well scoured. Totaling 82,064 cubic yards, the job was within range of organized enemy forces on a nearby island, and the men came in for their share of exposure to sniper fire. One rig carried a spare clamshell bucket on the bow, with jaws open, for no other purpose than to provide a handy foxhole. A machine gun that someone procured was used to fair advantage until a combat ship came in and gave the Seabees a little protection.

Job "D": Existing Japanese channel facilities were widened and deepened.

Setting Up for Work

The echelon landed in the Palaus on October 18, 1944. It brought two Northwest Model 80-D machines rigged with clamshell buckets on 60-foot booms, mounted on stationary bases set on 6 x 12 pontoon barges, which in turn were made from standard 5 x 5 x 7-foot prefabricated pontoons. These pontoons have served on different occasions for building everything from water tanks to cantilever-type bridges.

Two other Northwest 80-D machines, rigged the same way but mounted on crawler treads, were also on the equipment list. Two self-powered self-propelled anchor scows, a pair of 3 x 12 pontoon barges, one 4 x 12 pontoon barge, and one 3 x 7 pontoon barge completed the floating equipment. Camp equipment, lighting plants, small machine tools, and the vital water-distilling units, which made the only fresh water the men drank, were of course taken along on the trip.



A general view of a Seabee-built channel, nearly finished, in the Palau Islands in the Pacific. Light craft are already discharging cargo.

The clamshell rigs had only a few months' service under their cabs when they arrived at Palau. The two machines which were used continuously as

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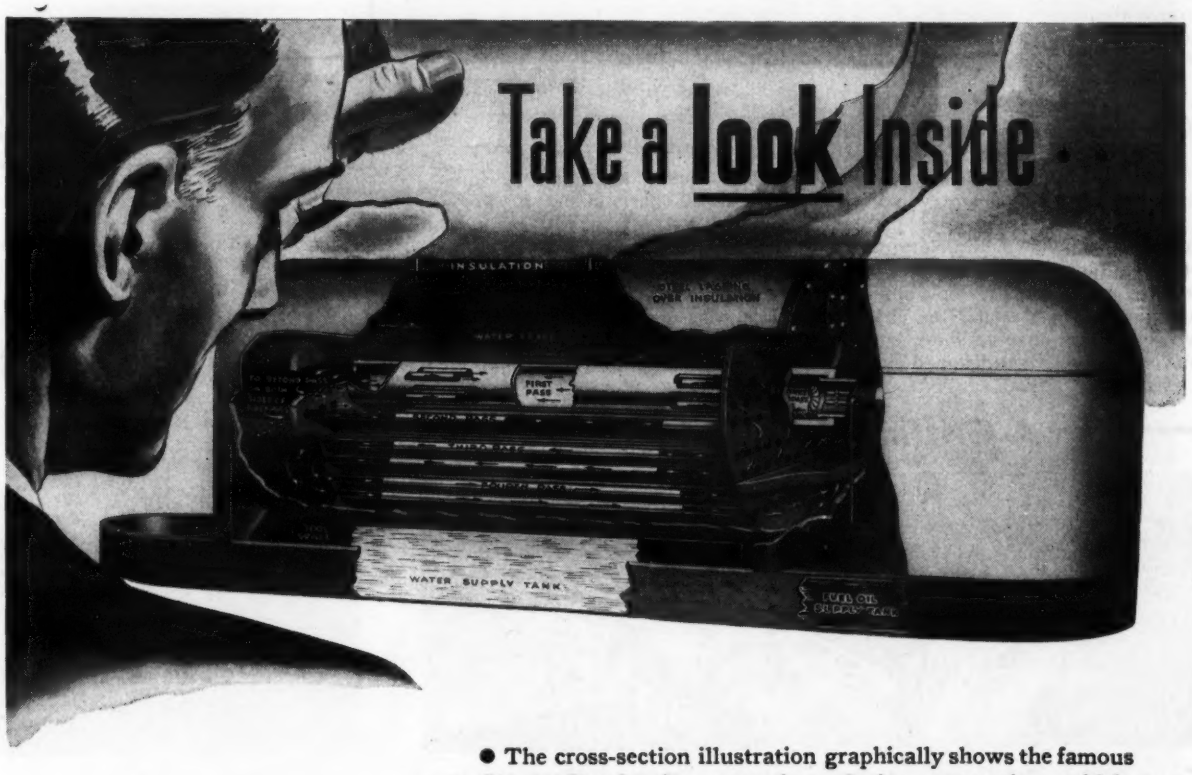

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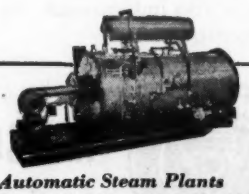

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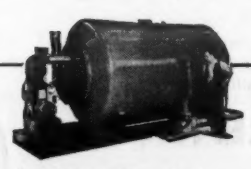

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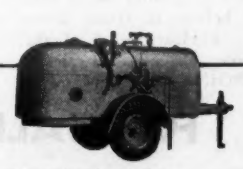

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Harbor Excavation In Hard Coral Rock

(*Continued from preceding page*)

clamshells were fastened on stationary I-beam mountings welded to the barge. These special bases carried the swing circle and center-pin gears. The other machines were used as clamshells about 50 per cent of the time, with their crawler tracks cabled down to the barge. The remainder of the time they were unloaded and worked ashore with dragline buckets. Two 1½-cubic-yard Northwest machines, also rigged as draglines were borrowed from the island command and accounted for 85,586 cubic yards of the total reported.

It was a hard, ugly island, beautifully verdant from afar but forbidding and somber close up. Coral needles with razor-sharp edges rose like stalagmites in the midst of green verdure to puncture and maim a man. This treacherous formation extended all the way through the area in which the Seabees worked, stopping finally where the coral reefs dropped off in deep water.

Blasting the Coral

It was not exactly a surprise, then, to find that almost every yard had to be loosened first by explosives. Time was of the utmost importance, so a crew of Seabees working from the pontoon barges sowed 60 per cent gelatin dynamite over the work site, trying to place about 25 pounds at 10-foot intervals. Caps were not put in all the charges; the propagation of underwater concussion took care of the uncapped charges.

Seldom would a charge loosen the coral more than 2 feet deep, and sometimes it was less than that. The explosive factor (cubic yards loosened per pound of explosives) was extremely low, 0.49 to be exact; but the engineers in charge felt the gamble with extra explosives was more than justified by pushing the job along faster. Wherever it was possible, gelatin was placed during low tide and shot at high tide to take advantage of the extra blanket of water over the explosives. The deeper the water, the more powerful was the downward force of the explosion.

Some Production Figures

When the final figures were in, 9,228 machine-hours had been expended by the four 80-D machines. Of these 6,033 hours were effective. The machines were digging 66 per cent of the time for an average yardage of 77 per operating hour. Of the individual machines, the highest hour efficiency was 75 per cent; the lowest was 54 per cent. The highest yardage per hour was 107 on a machine which doubled as a dragline; the lowest was 40 on a machine used exclusively as a clamshell. This reflects accurately the character of the coral. All machines were casting free.

Clamshell-Rig Efficiency

What makes the modern clamshell efficient? What hinders its performance? What advantages or disadvantages, as the case may be, contributed in their own way towards the completion of an excavating job that admirals admit was important? A list of the contributory factors may bring special

(*Continued on next page*)

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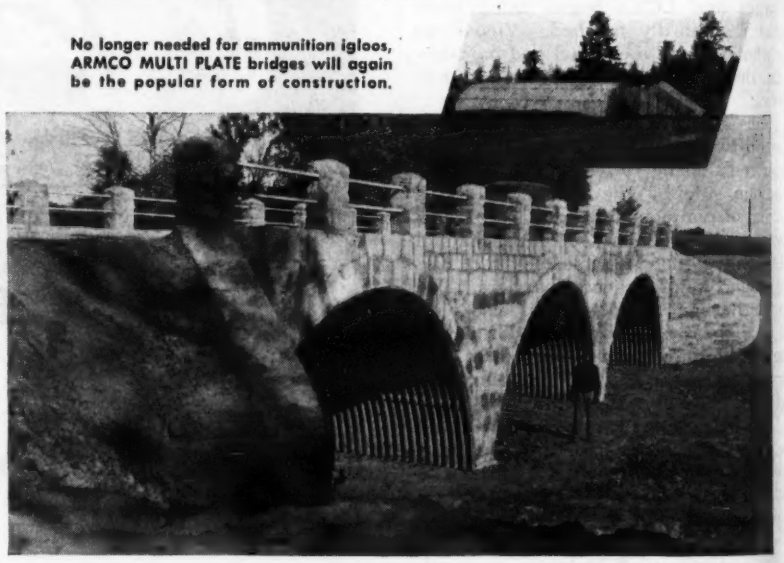

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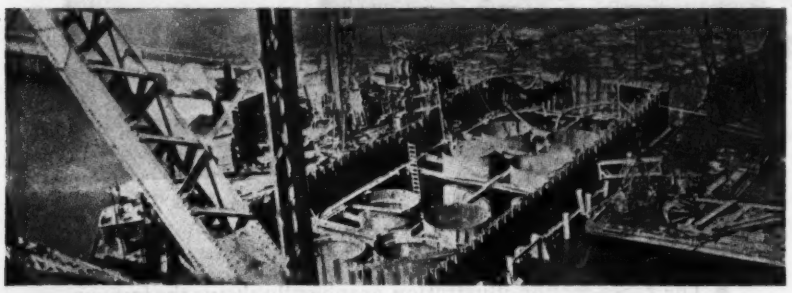

From a boiling sandy bottom to FIRM SUBGRADE under 20 foot river-water head

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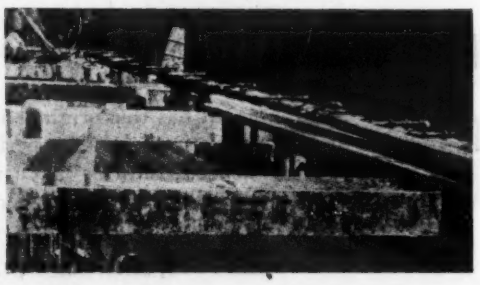

Open pumping to overcome the 20-foot river-water head outside this steel cofferdam on a bridge job proved too hazardous. The GRIFFIN SYSTEM removed the water to a point below subgrade, before it could cause trouble—a clear proof of the advantage of a GRIFFIN WELLPOINT SYSTEM over the open pumping. Note, in above small photo, setting reinforcing steel for concrete slab resting on completed caissons. Note the GRIFFIN WELLPOINTS hung on 3-foot centers.

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Harbor Excavation In Hard Coral Rock

(*Continued from preceding page*)

facts of value to light. It is believed that where the basic 50-year-old dirt-moving fundamentals appear, a listing of them will refresh many a dirt stiff's memory and do no harm.

The reasons for selecting the floating clamshell rig for this job were:

(a) By the very nature of its inaccessibility, the Palau job called for floating equipment able to reach the coral and powerful enough to dig it.

(b) The crane-operated clamshell is a self-contained unit when casting, in that it is independent of hauling units. There is nothing except the machine itself that can break down and affect its digging performance. Further, should one of four such rigs fail, the other three could keep digging.

(c) Here, where enemy offensive action still continued, the introduction of barge-mounted clamshells represented a small potential loss compared, say, to a $1,500,000 suction dredge. Requiring a much smaller crew than a suction dredge, the clamshells also represented a lower potential loss of life.

(d) The clamshells were about the smallest machine which would dig the coral, and therefore they required less shipping space than larger rigs.

(e) In case of breakdown, repair parts could be flown in, and more critical parts could be kept in stock.

Offsetting the advantages of these rigs were the following:

(a) Because of their limited size, the rigs could not operate in very rough weather.

(b) Not protected in any way from flying salt spray, it reached all parts of the machines whenever explosives were set off upwind. This resulted in an extraordinarily acute problem of maintenance. Salt spray ruined grease fittings, batteries, electrical parts, magnetos on the anchor winch engines, and even froze pins in the operating levers.

(c) In order to bring a heavy enough clamshell bucket down to bear on the hard coral, each rig had to be overloaded. Heavy-duty 7-ton Blaw-Knox buckets gave the best performance, but they had to be reinforced.

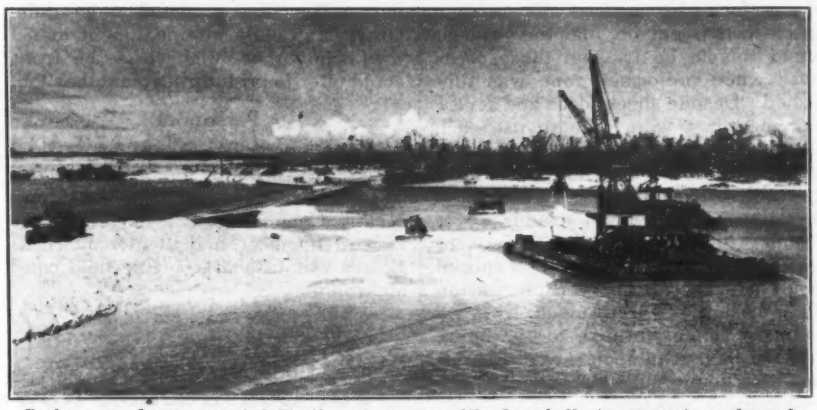
(d) Moving the rigs in high winds was so difficult that if an 8-foot move was contemplated, for instance, Seabees sometimes had to make paint marks on the forward cables to be sure the haul-in was sufficient.

(e) Undue attention had to be paid to the bucket by the operator. Working in very deep water, it was difficult to tell whether the bucket reached the bottom opened. In abrupt drop-offs, there was always danger of pulling the tagline weight up through the top of the "monkey cage" frames, which were fabricated and installed by Seabees in the field after standard counterweight equipment was found inadequate.

Some of the Trials

As the Seabees went about their work, they were beset with dangers and adventures many of them had not run into before, and which the boys say will last them for all time. One morning one of the rigs was working out along the edge of a freshly blasted coral reef. A hard, driving rain began to fall and the crew piled into the Northwest cab. Under the fore rake of the barge were dynamite charges, unexploded in the last shot, but the Seabees were unaware of it.

Powdermen nearby set off a charge and all the anvils of hell broke loose on the front end. She pitched and rocked, and glass in the cab windows showered down in rattling splinters. Perversely enough, the charge of 60 per cent had caught the concussion, exploded, and blew nine pontoons off the front end of the barge. Nobody was badly hurt and the rig stayed afloat, but Seabees worked late that night cutting three strings of pontoons out of their 3 x 7 barge, repairing the damage, and resuming work.



Seabees use barge-mounted Northwest cranes with clamshells to excavate a channel.

Another day a Seabee excavation foreman hit the deck as a Jap bullet ricocheted like an angry bee off the crane boom at his head. Almost any day they could see our own rocket bursts blossoming against Jap positions in the hills. Despite exposure, hard work, canned food, souvenir-hunting expeditions in Jap caves, and the best marksmanship the Japs could offer, every man returned alive.

They ran into almost every conceivable type of construction problem. Huge rock fragments, dislodged but not broken, had to come out. Even the empty buckets overloaded the machines, but the operators hooked on, boomed up, and brought the rock out anyway, in spite of this. The 80-D's stood up very well. Brake bands and clutches held up unless grease was introduced inadvertently.

The maintenance of deck engines was a constant headache. These were gasoline engines, and spark plugs and magnetos soon went the way of all parts under salt spray. These engines had no starters and had to be kept running steadily at the expense of two barrels of gasoline a day on each rig.

The standard grease fittings froze up. The screw-on fittings failed first, and soon the supply of this type of fitting was gone. Air-mail shipments, sent by express, failed to arrive, and the

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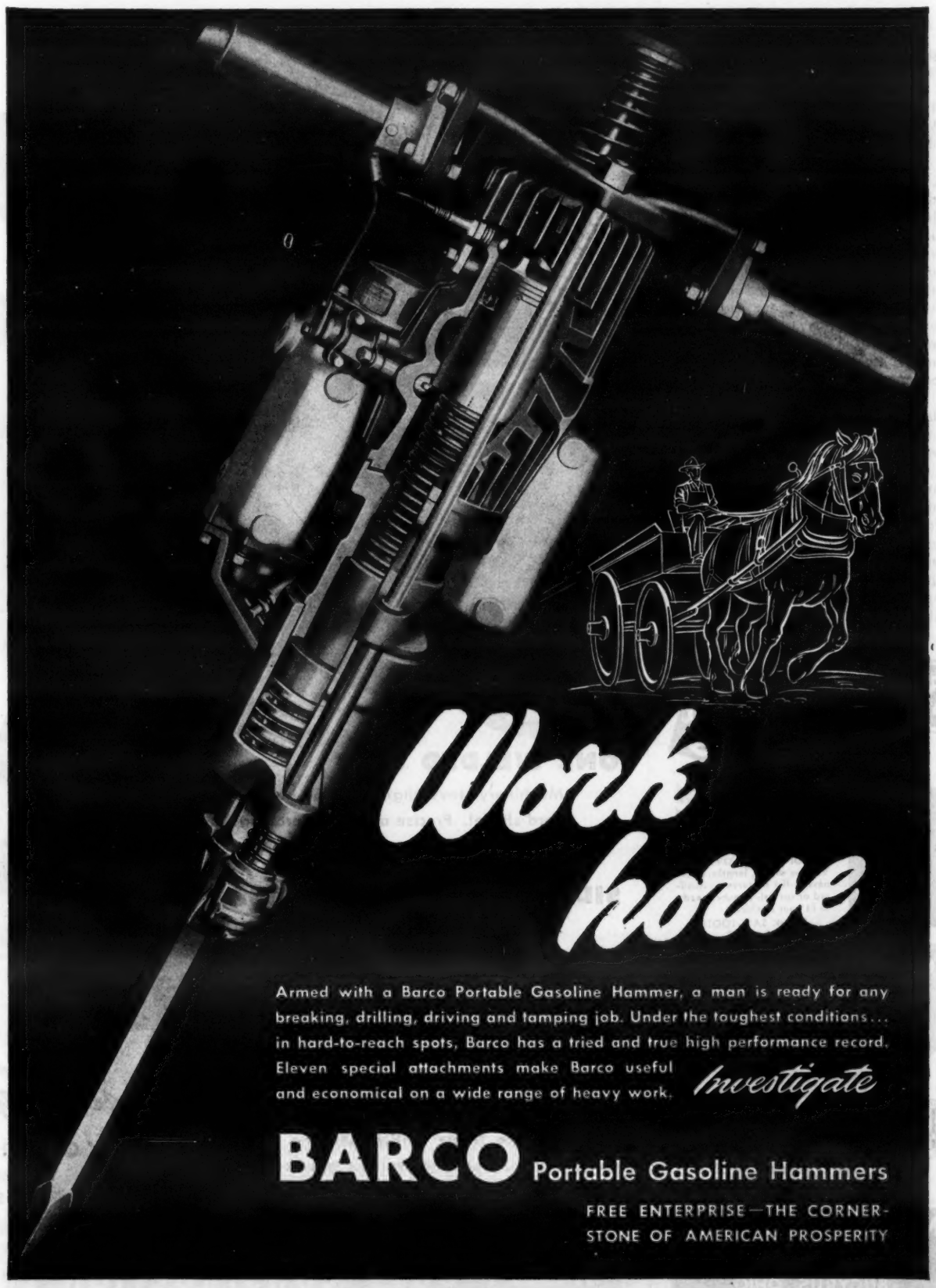
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Seabee welder C. C. Paskewitz of Brooklyn, N. Y., reinforces a clamshell bucket with pieces of anchor chain links.

Harbor Excavation In Hard Coral Rock

(*Continued from preceding page*)

desperate Seabees installed fittings from wrecked automotive equipment and stayed with it.

The hard digging wore clamshell lips, broke off teeth, and loosened rivets. Bucket lips were strengthened by facing them with stainless-steel welding rod, and all the rivet heads were spot-welded. Clam closing sheaves were rebushed or replaced.

Clam closing is one of the hardest uses to which wire rope can be subjected. Here the normal flexing over sheaves was augmented by shock loads, both on the clam buckets and on the wire cables running out to the anchors. In rough water, with wind, ⅞-inch-diameter steel cable sang and sometimes snapped when the full weight of the rig surged against it in a swell. Added to this was a very bad corrosion factor; the salt water literally played havoc with all cable even though it was lubricated with crater compound.

Further, not all the cable that was furnished was preformed. When non-preformed rope was used, it sometimes failed in as short a time as 6 hours, especially where it was used on clam closing lines. On account of each wire being pre-shaped before it goes into the finished rope, all the wires and strands of a preformed rope share alike when a shock load is put on, and the Seabees found this to be true on those occasions when preformed rope was furnished. Despite shock loads and severe bending, they were able to use each closing line until it was completely worn out. If it was not preformed, the cable almost always broke, due to the failure of individual strands.

Many different brands of cable were used. The Navy indorses no special manufacturer. Ordinary cable life on clam closing service ranged from 48 hours, if non-preformed, to 192 hours if preformed. One inch, 6 x 19 regular lay, with hemp and independent wire-rope centers, was used.

The job was finished on schedule on February 20, 1945, despite a tropical hurricane which lashed in about 15 days after work began and beached most of the clamshells and other floating equipment as much as 2 miles from the site of the work. Very little damage was suffered, however, and the machines were back at work in five days. The job, completed under difficulty, is an enduring monument to 180 men who braved the worst the front could offer to push through another job.

Personnel

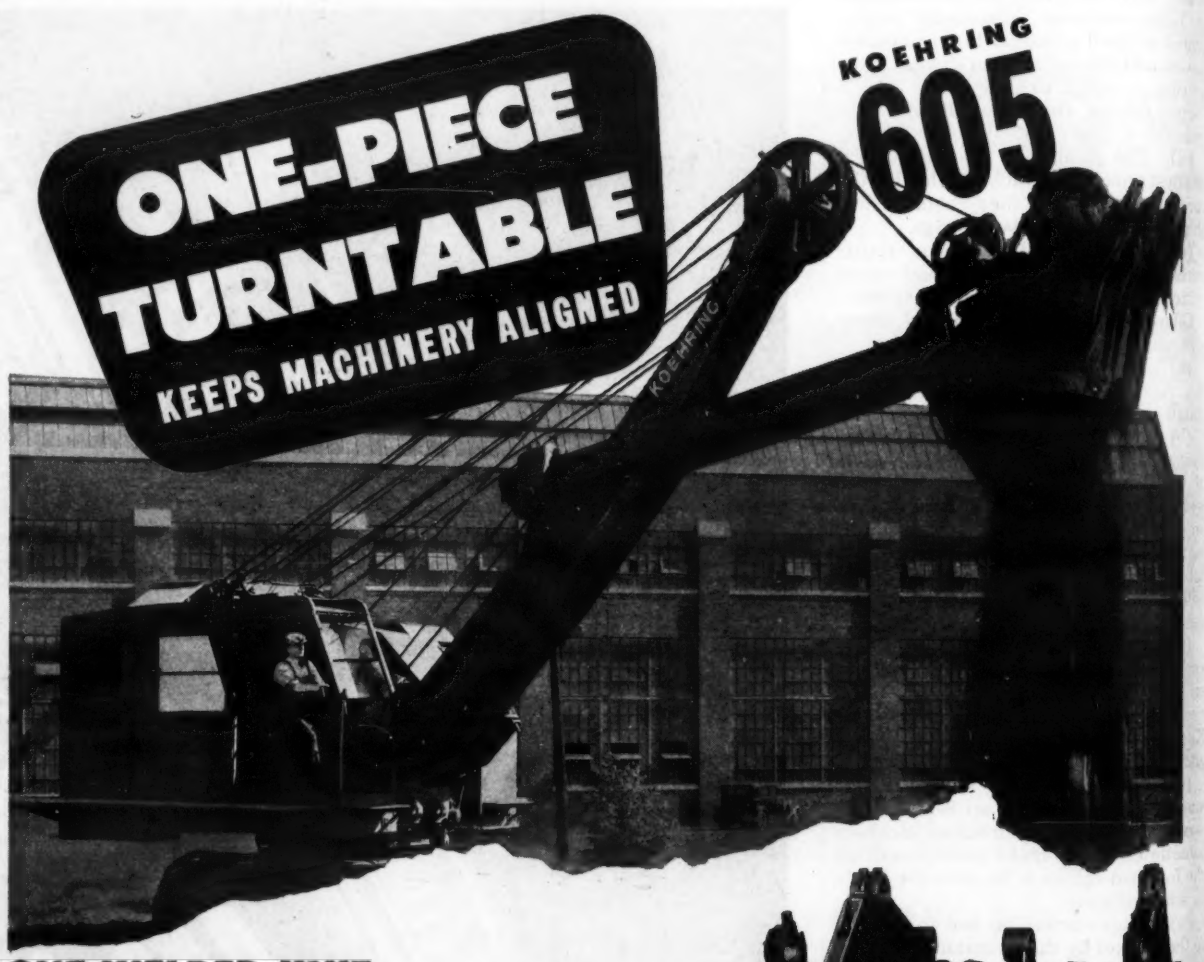
Commander F. G. Elliott, CEC, USNR, of St. Louis, Mo., is the Officer in Charge of the 301st Battalion. Lieutenant Commander C. E. McKay is executive Officer, and Lieutenant H. E. Echols was in charge of the field construction.

Full Output of Tires For Construction Now

Cancellation of Government tire orders for military-construction purposes following the end of the Pacific war will release the full output of tires for highway trucks and off-the-road equipment, according to an announcement by W. A. Kemmel, Truck-Tire Sales Manager for the Goodyear Tire & Rubber Co., Akron, Ohio. Since the rubber industry does not face a reconversion problem as far as tire production is concerned, these tires which have been going largely to the armed forces are now being diverted to civilian channels, Mr. Kemmel pointed out.

Goodyear overall production of truck and off-the-road tires is twice that of the pre-war civilian demand, and tires already in production or made up for military delivery include a large percentage which are suitable for peacetime purposes. With an uninterrupted tire production over a period of 60 to 90 days, it should be possible to fill much of the near vacuum which exists on tires in the construction industry.

As far as tires for pick-up trucks, ¾, and 1-ton trucks are concerned, the situation has greatly improved, and there are good stocks at most points in the field. Goodyear has now gone into production of its extra-traction tire, the studded Sure Grip, designed particularly for use where road conditions are bad because of the weather during autumn and winter seasons.



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Common Sense Solves County Road Problems

(*Continued from page 6*)

during 1938. Steel sheet piling 60 feet long was driven in such a manner that eight pieces of 16-inch 30.7-pound piling formed an interlocked octagonal pile 2 feet 11 inches in diameter under each of the four columns which made up the two stream-channel piers. The inside was excavated to an elevation 10 feet below the stream bed and filled with concrete to a point a short distance above low-water elevation. Above this point, octagonal concrete posts joined by a 10-inch-thick web wall extend to the truss seats placed 23 feet above low water.

An old 119-foot-span steel truss, consisting of seven 17-foot panels with a 17-foot roadway, which had been removed from a road where its width was insufficient, was moved to the new location, strengthened by welding plates to the top and bottom flanges of the floor beams, and erected with a concrete deck over 4 x 16-inch fir stringers, to provide a structure for an H-15 loading.

This organization has achieved successful results in the use of precast concrete culverts and in the construction of composite structures using second-hand railroad rails for pile bents. This work will be described in a subsequent article.

Servicing of Equipment

Although Monterey County provides storage yards in each of the five districts established for maintenance control, most of the repair work, other than minor adjustments, is done in the central shop at Salinas.

This is located at the county yard, a plot of ground 100 feet wide and 800 feet long enclosed by a woven-wire mesh fence 10 feet high, adjacent to the main line of the Southern Pacific Railroad just south of Salinas. In addition to the repair shop, which is a concrete-block building 50 x 150 feet in size with a sheet-metal roof supported by steel trusses, this yard contains a track running almost its full length near the center line, on which is operated an old railroad steam crane with a 50-foot boom which was re-powered with a gasoline engine in the county shop. This crane serves the concrete casting yard and the area in which precast sections are stored for future use, and the small asphalt plant used for the preparation of pre-mixed bituminous patching material. It is also used in the areas in which are stored a considerable quantity of second-hand railroad rails, a valuable supply of redwood timbers 8 x 16 and 8 x 18 inches in size and up to 34 feet in length with a few 12 x 18 inches in size and 32 feet long, and a number of corrugated-metal culverts, removed and replaced by larger structures, which are now available for reuse.

Behind the main shop building in the same yard is a sheet-metal open-sided shed for the storage of trucks or other rolling equipment. Across the yard from it, near the north end, are four sheet-iron buildings 20 x 20 feet in size, one utilized for a testing laboratory, one for the storage of lubricants, and the other two for storage of the Bridge Department's small tools and equipment.

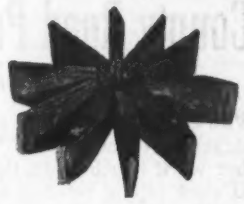
The main shop building, entered through four 10 x 12-foot overhead doors in its east side, has two 10-inch I-beams at 22-foot centers supported below the roof trusses to provide a track the full length of the building for a gantry crane of 5-ton capacity. Just inside the northernmost of the doors is a gasoline dispensing unit. The end of the shop north of this door is partitioned off to provide an office in the northeast corner, with a washroom behind it. A stockroom, west of the office and washroom, extends across the remainder of the north end, separated from the main open shop by a wood and woven-wire partition.

A concrete floor covers the entire shop area except for a greasing pit 5 feet wide, 5 feet deep, 40 feet in length parallel to the long side of the building, and in the approximate center of its width. This pit is kept covered by 4 x 12-inch boards which permit trucks or other rolling equipment coming in through any of the east doors to cross it and park with their front wheels west of the pit and their rear wheels east of it. The planks are then removed from their supporting recess in the pit's side walls, giving workmen in the pit easy access to the under side of the trucks.

Under the windows in the east wall, which with windows in the north end and skylights in the roof provide ample working light, is a wooden work bench extending the length of the shop, with

(*Continued on next page*)

Each Dipper Tooth made *GOOD AS NEW* in only 30 Seconds!



Shovel digger teeth wear rapidly. Particularly in rocky soil and gravel where they are subjected to excessive abrasion, shock and impact.

To make the teeth of buckets more wear-resistant, to keep them sharp longer and avoid frequent replacements, many companies are relying exclusively on Coast Metals Hard-Facing. Applied to the teeth, as well as lips, runners and other parts, it successfully protects these vulnerable points so that the bucket functions more effectively, more quickly, and at a significant saving in power. After the teeth become slightly worn, they are then given another Coast Metals Hard-Facing and once again made good as new . . . in only 30 seconds!

Coast Metals Hard-Facing meets today's needs for making all machinery, equipment exposed to severe wear last longer. Easily applied by the electric arc or gas torch to any ferrous metal including manganese steel, alloy steel, cast iron and chilled iron. New revised edition of Form X-201 goes into full detail. Write for your copy today.

COAST METALS, INC.
Plant and General Offices:
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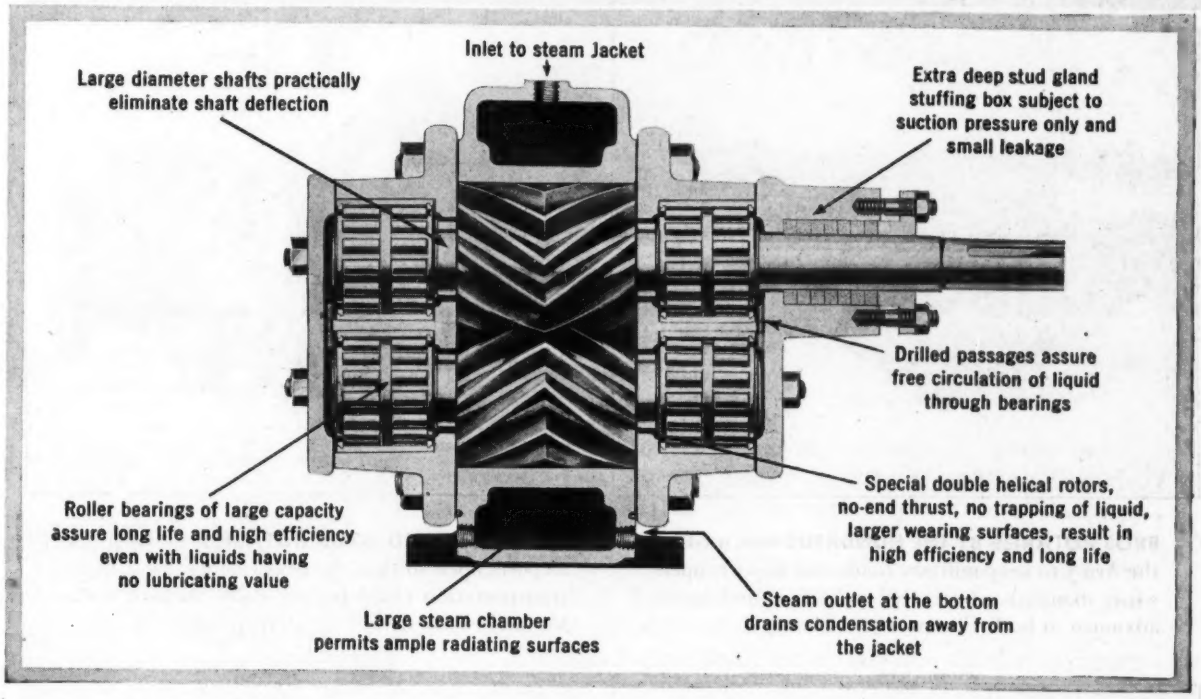
COAST METALS *hard-facing weld rods*
MAKE YOUR EQUIPMENT LAST LONGER

HOW TO HANDLE ASPHALT WITHOUT GETTING "STUCK"


Inlet to steam Jacket
Large diameter shafts practically eliminate shaft deflection
Extra deep stud gland stuffing box subject to suction pressure only and small leakage
Drilled passages assure free circulation of liquid through bearings
Special double helical rotors, no-end thrust, no trapping of liquid, larger wearing surfaces, result in high efficiency and long life
Roller bearings of large capacity assure long life and high efficiency even with liquids having no lubricating value
Large steam chamber permits ample radiating surfaces
Steam outlet at the bottom drains condensation away from the jacket

Specify Worthington GRJ Steam-Jacketed Rotary Pumps

Trouble-free handling is what you want in the pump you depend on for putting asphalt where you want it when you want it.

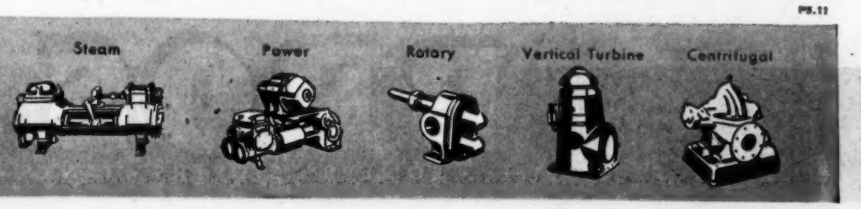
Fortunately, you can get dependability in a Worthington GRJ Steam-Jacketed Rotary Pump. The cross-sectional picture above shows you why. One thing the picture doesn't show, however, is the short starting time which results from the large radiating surfaces of the Worthington heating jacket. That means less time lost by equipment and men waiting for asphalt to flow.

Your nearby Worthington Representative can give you other valuable facts about Worthington GRJ Rotary Pumps. In the meanwhile, you can prove that *there's more worth in Worthington* by writing for Bulletin W487-B11.

Worthington Pump and Machinery Corporation, Harrison, New Jersey.

WORTHINGTON

THE WORLD'S LARGEST MANUFACTURER OF PUMPS



Common Sense Solves County Road Problems

(*Continued from preceding page*)

a Van Dorn valve refacer and a battery charger on its north end. There is another work bench along the south wall and steel rolling benches are also used to hold tools and parts while the mechanics are working directly on a machine. A storage board for special tools, with the outline of each tool painted on it to mark its proper position, is over the south end of the west-side work bench; and a wooden rack for the subdivided storage of steel and iron straps and rods is in the southwest corner of the shop near the forge. A Champion blower, a 50-pound Little Giant trip-hammer, and a Marvel No. 2 power hack saw flank the forge. A Hendley & Whittemore power punch and shear having 6-inch shear blades and power to punch a ⅞-inch plate is located nearby, as is a 60-ton Manley hydraulic press.

An A. V. Carroll lathe with a 10-foot bed and 18-inch swing and a Smith & Mills 16-inch shaper, with a Canedy-Otto 22-inch drill press and a pedestal buffer and grinder, are included in the machine-shop equipment, all driven through overhead shafting and belts by a 5-hp electric motor. A similarly driven band saw is conveniently placed for carpenter-shop operation.

On our visit to the shop, one mechanic was using a Victor cutting torch with Victor gages and valves to remove a bent piece from the frame of a motor grader, and another was preparing to use one of the two 150-ampere Hobart arc welders with which the shop is equipped to do some welding on the same machine. A 200-ampere portable Hobart arc welder was also in the shop but is ordinarily used in the field almost continuously by the bridge crew. Another mechanic was making adjustments to a shop-built machine for the re-winding of power brooms.

William F. Curtis, Monterey County's Shop Superintendent, has exercised his ingenuity in rebuilding, combining, and constructing many items of value to the county's maintenance and construction forces. One of these machines is a front-end loader for use on an Allis-Chalmers Model K tractor. An unusual feature of this machine is its easy demountability, allowing a change from the loader to a bulldozer in 5 minutes. Extensions of the track roller frame support two vertical 4-inch-diameter hydraulic cylinders. Pulleys on the top of the hydraulic piston rods carry cables which are anchored to the tractor and are easily detachable from the 18-cubic-foot bucket which is supported by built-up struts swinging from extensions to the back axles of the tractor, and proportioned so that the 36-inch lift in the piston rods produces an 8-foot lift of the gravity dumping bucket. A feature of this bucket is that it is flared to cut as wide as the ex-

(*Concluded on next page*)

adeco...

NOZZLE TESTER

Keeps Diesel Engines Running Efficiently

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

Light in weight yet built for heavy-duty service, it enables any mechanic to make quick accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p. s. i. Prevents costly delays and possible damage to engine.

Ideal for testing hydraulic devices.

Write for bulletin on this practical, low-cost unit.

TESTS FUEL INJECTORS AND HYDRAULIC DEVICES at Pressures up to 10,000 p.s.i.

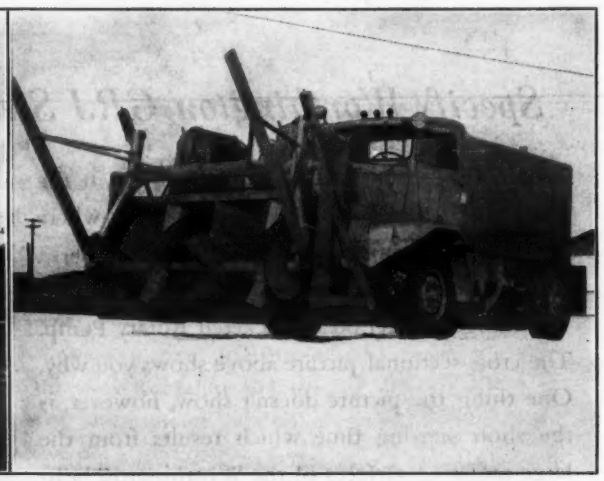
ADECO AIRCRAFT & DIESEL EQUIPMENT CORP.

DEPT. 9: 4411 N. RAVENSWOOD AVE. CHICAGO 40, ILLINOIS

MASTER OF SNOW AND ICE

BROS ROTARIES BY THE HUNDREDS were used by the Army to keep military roads and airports open when demands of strategy called for undelayed advances in both Europe and America.

THE NAVY USED BROS ROTARIES to keep the airports open so that the heavy demands of flight transportation could be met daily without needless and costly delays or interruptions.



RAILROADS USED BROS ROTARIES to keep their main lines open and to remove the ice hazard in open stations and in congested switch yards. A loading chute permits side-loading into cars.

CITIES, COUNTIES AND STATES used Bros Rotaries to keep the streets and highways open for the Nation's traffic. Wm. Bros Boiler & Manufacturing Company, Minneapolis 14, Minnesota.

Give us your Snow Problems—we'll give you the answer

BROS

FABRICATORS OF STEEL • BOILERS • STOKERS • TANKS • ROAD EQUIPMENT

ENGINEERS WANTED

Mechanical
Electrical
Civil

Preferably those with

EXPERIENCE ADAPTABLE TO AIRCRAFT

Layout Draftsmen
Aerodynamicists
Stress Analysts

Or others with at least several years of engineering experience which will serve as a basis for aircraft work.

Permanent positions are available in the engineering of such planes as the Martin 202 transport, commercial version of the Martin MARS, and other new commercial and military commitments. Write including full information on education, experience and background,

to DIRECTOR OF ENGINEERING PERSONNEL,
THE GLENN L. MARTIN COMPANY
Baltimore 3, Maryland

Common Sense Solves County Road Problems

(*Continued from preceding page*)

terior width of the tracks, which is of value when the machine is used for cleaning drainage channels or working in similar narrow trenches.

Another item made in the central shops is a sectional cattle guard. Used railroad rails of 45-pound weight are cut into 10-foot lengths and seven of them are welded at 9-inch centers to 4½-foot pieces of similar rail placed at right angles beneath their ends. Each section provides, therefore, a 10-foot-wide driveway across which cattle will not travel. They are ordinarily supported by a buried wooden box with the end rails resting, parallel to the direction of travel, on its ends. If loads too heavy to be safely carried by the 10-foot-long rails are anticipated, additional supporting stringers of steel rails can be inserted under the cross rails parallel to the line of travel.

The entire shop-operating expenses, including the salaries of the Shop Superintendent and the four mechanics permanently employed, plus such additional help as is needed, are paid from a fund provided through an hourly charge against the road districts for the use of equipment. This hourly charge is established at a rate to provide for depreciation (figured in a straight line for the expected useful life which is varied on different items), fuel, lubricants, repairs, and insurance.

Post-War Planning

Monterey County has received $18,213 from the California Post-War Planning Fund and now has a field survey party and three engineer-designers who devote much of their time to this important work. Progress is being made and the County expected to have plans and contract documents for a number of essential projects completed before the cessation of hostilities so that contracts may be awarded and actual construction initiated promptly thereafter.

The Monterey County, Calif., Road Department is headed by Howard F. Cozzens as Road Commissioner, with Charles Vogel as his principal engineering assistant. The bridge maintenance and construction are also directed by Mr. Cozzens, with construction operations supervised by Bridge Superintendent L. Camany. W. F. Curtis is Superintendent of the county shops.

New York State Receipts For Roads in Ten Years

New York State highway receipts during the decade 1934-1943 aggregated $1,390,745,000. This sum was made up of $1,095,358,000 from the motor-fuel tax, registration fees, special carrier imposts, and tolls; $113,940,000, Federal Aid; $1,829,000 from other Federal contributions; $142,823,000, proceeds from the sale of bonds; $8,737,000 received for highway use from local government jurisdictions; $13,879,000, earnings from the sinking fund; and $14,179,000, miscellaneous income.

Disbursements during the same period amounted to $1,375,071,000, representing $27,510,000 for the collection and administration of motor-vehicle imposts; $334,376,000 for construction; $96,449,000 for maintenance; $8,358,000 for administration, engineering, and equipment; $12,709,000 for the state highway police; $51,519,000 for repayment of borrowed money; $74,639,000 for interest on debt; $235,843,000 expended on local roads or made available to minor jurisdictions for that purpose; and $533,668,000 for non-highway purposes.

The State of New York is the greatest offender in the diversion of highway-user taxes to non-highway purposes, having diverted 31 per cent of the total of such tax diversion by all the states guilty of that practice during the decade covered. The $533,668,000 so used closely approaches 50 per cent of its total highway-user imposts.

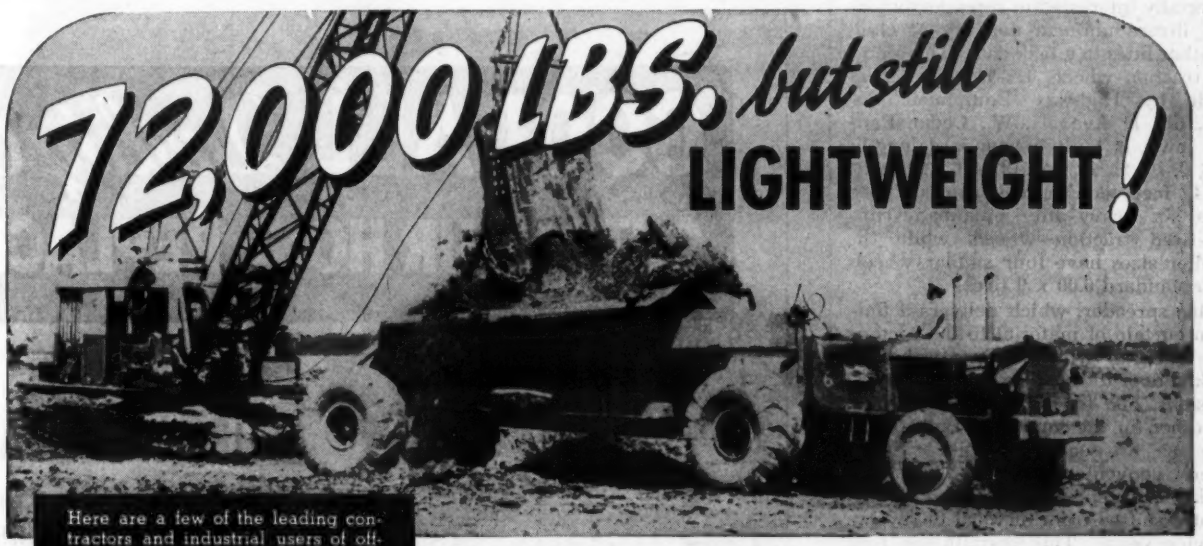
These figures were taken from data in the "Highway Facts" studies being issued by the National Highway Users Conference for each state. Single copies are already available for a number of states at $1.00 each, or in quantities of 10 or more, for 75 cents. Requests should be directed to the National Highway Users Conference, National Press Bldg., Washington 4, D. C.

The new $7,000,000 Panama National Airport, the contract for the design of which was awarded to F. H. McGraw & Co. of Panama, will offer complete facilities for passenger and cargo service. Here is an architect's drawing of the administration building. The two-story reinforced-concrete terminal building will be 625 feet long and contain approximately 300,000 square feet of space. It will be air-conditioned and will include restaurants, observation terraces, and all the latest innovations in passenger convenience, engineering skill, and operating efficiency.

Insley Appointments

Charles A. Menefee has been made Manager of the field service and parts department of the Insley Mfg. Corp., Indianapolis, Ind., maker of excavating, material-handling, and concrete equipment. Mr. Menefee, who has been with Insley for 18 years, was active in the recent reorganization of the department, which is now a separate unit and will carry its own parts inventory.

Donald A. Koehler has been appointed to the newly created post of Commodity Director for the coordination of procurement and production schedules. Mr. Koehler was formerly connected with the Chicago office of the U. S. Navy's Bureau of Yards and Docks. Prior to that, he operated his own firm, the Koehler Construction Co., in Lincoln, Nebr.



Here are a few of the leading contractors and industrial users of off-the-highway hauling equipment that are new owners of Euclids:

Algoma Ore Properties, Ltd. Sault Ste. Marie, Ont.
B & M Construction Co., Pittston, Pa.
Blair Quarries Blair, S. C.
John Booth, Inc. Carbondale, Pa.
A. B. Burton Co. Lynchburg, Va.
W. L. Cobb Construction Co. Decatur, Ga.
Donegan Coal Co., Fenwick, W. Va.
H. C. Frick Coke Co., Pittsburgh, Pa.
W. E. Graham & Sons, Roanoke, Va.
Samuel Krauss Co. St. Louis, Mo.
Limestone Products Uhthoff, Ont.
McFeeley Brick Co. Latrobe, Pa.
H. E. Millard Annville, Pa.
Morgan Coal Co. Bryant, Ill.
Peacock & McQuigge, Ltd. Toronto, Ont.
Pickands-Mather & Co. Duluth, Minn.
Richmond Coal Co. Marfrance, W. Va.
Standard Lime & Stone Co. Baltimore, Md.
Walsh Construction Co. New York
Walters & Prater, Morristown, Tenn.

A hauling unit with a gross weight of 36 tons is big equipment in any man's language, but the Bottom-Dump EUCLID is "lightweight" by virtue of its large payload capacity. Bottom-Dump EUCLIDS weigh approximately 32,000 lbs. but have payload capacity of 40,000 lbs. — a ratio of 125 lbs. payload per 100 lbs. of unit weight.

Designed and built expressly for off-the-highway hauling, Rear-Dump and Bottom-Dump EUCLIDS are favored by contractors and industrial owners because of their speed, capacity and rugged simplicity. With modern, efficient loading units and high-speed, large-capacity Euclids, you can move earth, ore, rock and coal at less cost per ton on short and long hauls. Write us or your Euclid distributor for interesting facts and figures on dependable Euclid hauling equipment.

The EUCLID ROAD MACHINERY Co.
CLEVELAND 17, OHIO

EUCLID
SELF-POWERED HAULING EQUIPMENT
For EARTH . . ROCK . . COAL . . ORE
CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

The Model R traction Hi-Way spreader is available in lengths of 8 to 13 feet.

Traction Spreaders For Surfacing Jobs

With the tremendous mileage of roads being resurfaced to keep them in condition pending reconstruction, both contractors and highway engineers are especially interested in spreaders which will insure uniform delivery of chips or other fines to a tack coat. The Model R traction-wheel Hi-Way spreader made by Highway Equipment Co., Inc., 616 D Ave., N. W., Cedar Rapids, Iowa, is built in standard lengths of 8, 9, 10, 11, 12, and 13 feet. All models 12 feet wide or over are equipped with six heavy-duty pneumatic-rubber-tired traction wheels while the smaller sizes have four similar wheels with standard 6.00 x 9 tires.

This spreader, which delivers a uniform curtain of material to the road as the truck to which it is attached is backed over the surface, has two transmissions, one for the feed roller, and the other for the conveyor. Both transmissions are equipped with shifting levers conveniently located at both ends of the spreader and can be instantly shifted from forward to reverse or vice versa. This permits the feed roller and conveyor to turn in the right direction at all times, regardless of whether the spreader is in forward motion or reverse. The spreader is claimed to be foolproof in that if it is shifted into the wrong gear by the operator it will automatically throw the transmission into a neutral position without causing any damage. With this transmission it is unnecessary to remove the conveyor and turn it end for end when the spreader is being changed from forward motion to reverse.

The agitator and conveyor of the Model R are combined in one. By this arrangement the material is carried to both ends of the spreader box by right and left spirals. All bearings are equipped with Alemite-Zerk lubrications fittings.

A new folder recently issued by this company not only describes and illustrates the Model R spreader, but also shows this company's other types of sand and cinder spreaders. Copies will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to the manufacturer and mentioning this illustrated news item.

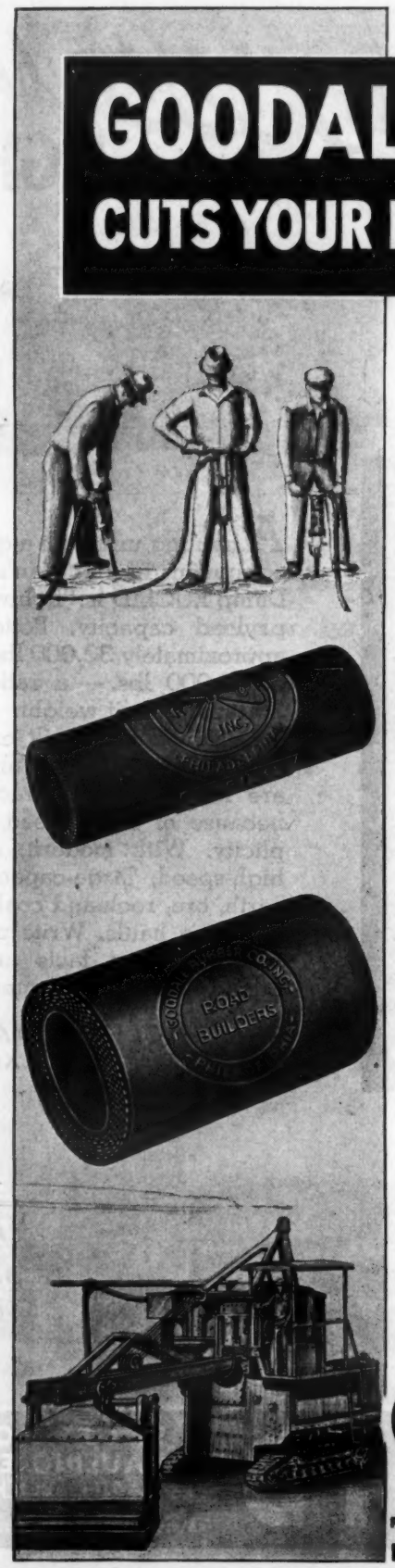
Several Plant Managers Are Shifted by du Pont

Curtailment of military explosives production has resulted in the shifting of a number of men in the Explosives Department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. F. T. Beers, Manager of the commercial explosives plant at Du Pont, Wash., since 1923, is retiring at the age of 70. Mr. Beers stayed at his post five years beyond retirement age because of the Government's need for all the experience available in war production. R. F. Boltz, Manager of the Government-owned and du Pont-operated Alabama Ordnance Works, succeeds Mr. Beers.

E. R. Wright, Manager of the Birmingham, Ala., Works, a commercial dynamite plant, is also retiring, and is succeeded by A. S. Albright, Manager of the Louviers, Colo., commercial plant. P. S. Cushing, Manager of the Wabash Ordnance Works, Terre Haute, Ind., is taking over Mr. Albright's position at Louviers, and R. P. Kelly, who has been on special assignment in connection with Government work, becomes Assistant Manager at Birmingham.

A. W. Skerry, who has been on special assignment in Wilmington in connection with Government work, becomes Manager of the Seneca, Ill., commercial plant, with O. S. Delancey as Assistant Manager.

W. D. Garwood, Assistant Manager of the Birmingham Works, has been appointed special assistant to the director of production of the Explosives Division at Wilmington.


GOODALL Quality Construction
CUTS YOUR HOSE REPLACEMENT COSTS
"SUBWAY" HEAVY DUTY AIR HOSE
All-Synplastic construction. One of Goodall's oldest and best-known brands, with tube, carcass and cover especially made for heavy-duty service on all types of pneumatic tools. Sizes ½" to 1¼", inclusive.
• • •
"ROADBUILDERS" WATER HOSE
The hose with the reputation for long-life performance on pavers, mixers and other heavy duty water hose jobs. Tough, black cover on Goodall quality carcass. Light in weight, with good flexibility. Sizes 1" to 2", inclusive.
• • •
Goodall Means "On the Job Longer!"
All Goodall products are made to specifications that assure an extra measure of service wherever they are used. Their quality and reliability are the result of 75 years devoted to furnishing better and better hose, belting, boots and clothing to American industry.
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Contact Our Nearest Branch or Main Office for Details and Prices.
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Established 187

Standards of Design For National Routes

AASHO Committee Recommends Basic Standards of Design for Our National System of Interstate Roads

WITH the passage of the Federal-Aid Highway Act of 1944, a new era in highway construction came into being in this country. The American Association of State Highway Officials sometime ago entered into a cooperative agreement with the Public Roads Administration for the investigation and subsequent recommendation of operating procedures to the Public Roads Administration for the administration of the Act. Under the procedure established, various Association committees were assigned particular problems. Among these was that of design standards for the National System of Interstate Highways, the recommendations for which have recently been adopted as policy by the Association.

Definition

In general, the basic standards of road and structural design in the report of the National Interregional Highway Committee are recognized as embodying the elements of design to produce the highway facilities that now appear, as a long-range plan, necessary for the limited mileage of highways to be designated as the National System of Interstate Highways. Some of the design standards recommended necessarily are shown as minimum values. Since many states are now well along in the preparation of plans, it is recommended that changes in these plans not be required where they do not wholly meet the standards decided upon.

The desirable design standards for projects on the National System of Interstate Highways are defined as a set of values or controls, the use of which is intended to produce highway facilities which represent the best practice in the light of present knowledge. These are long-range standards for the future and it is recognized that, in the interim period, stage construction may be permitted and that, for certain conditions, it may be necessary to utilize values lower than the minimum suggested.

Traffic Basis

References to traffic warrants in the standards are made in terms of peak-hour traffic determined as a basis for design. It is now deemed advisable that design be made to accommodate the 30th highest hourly traffic density of the year.

The Committee recommends that the Interstate Highway System provide or allow for the subsequent provision of facilities capable of serving safely and efficiently a mixed traffic of passenger cars, buses, trucks, and tractor-trailer and semi-trailer combinations of a volume of each of the constituent elements estimated to be that which will exist 20 years from the date of construction.

Control of Access

Controlled access for highways is defined to mean the permission of access to and from adjacent property at certain locations and for certain purposes and the permission of interchange with selected intersecting streets or highways.

Where state laws permit, control of access shall be obtained on all new locations and on all old locations where economically possible. A design with frontage roads may be used for this purpose. In those states which do not have legal permission to acquire control of access, additional right-of-way should be obtained, adequate for building frontage roads connecting with controlled-access points, if and when necessary.

Grade-Crossing Elimination

Where railway operation involves two or more main-line tracks, separation should be provided, regardless of traffic volumes on the interstate highway. Where the railway operates six or more regular train movements a day on a single track, separation of grades may also be justified, regardless of traffic volumes on the highway. Where the railway has five or less regular train movements a day, grades should be separated when an economic analysis justifies, proper weight being given to both hazard and delay. Where grades are not separated, provision should be made for the installation and operation of adequate protective devices.

For a design traffic density of 3,000 or more on an interstate highway, every effort should be made to eliminate all cross traffic at grade. For lower traffic density, cross traffic at grade should be

(*Continued on next page*)

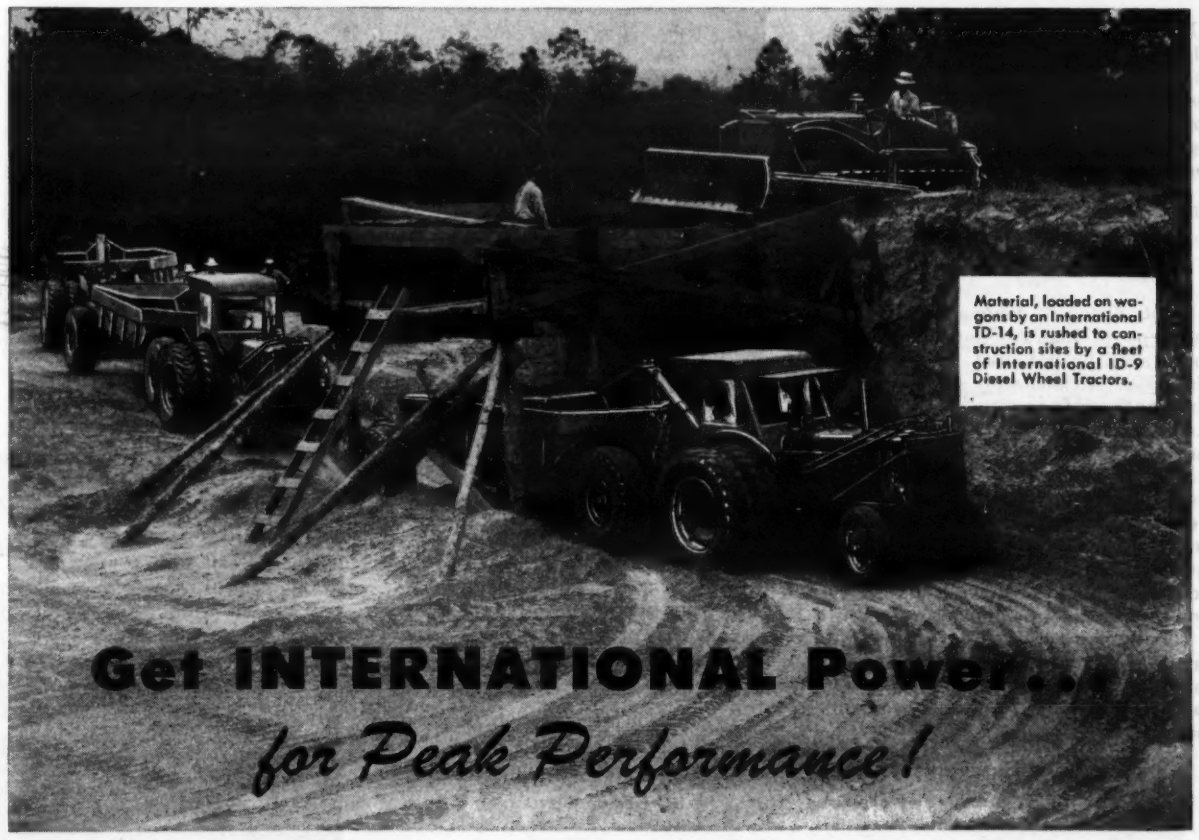
For Speedy heating of tar and asphalt—

Use this CONNERY oil-burning Patrol Patching Heater on the *small* job and this CONNERY oil-burning kettle for *large-quantity* production.

Write for catalog showing our full line of tar and asphalt heating kettles, spraying attachments, pouring pots, etc.

Connery Construction Co.

2nd and Luzerne Streets — Philadelphia 40, Pa.


Material, loaded on wagons by an International TD-14, is rushed to construction sites by a fleet of International ID-9 Diesel Wheel Tractors.
Get INTERNATIONAL Power...
for Peak Performance!

• International TracTracTors for those tough, grubby jobs that require the power and sure-footed traction of a crawler. International Wheel Tractors for fast, heavy hauls. That's the right combination to reduce man-hours, speed up the work cycle and cut costs in material handling and construction.

Peak performance from Internationals is assured by their advanced design. For example: more of the engine horsepower is delivered to drawbar and power shaft because all working parts are positively and permanently aligned, and ball bearings are used generously in transmissions and drive shaft assemblies.

International's easy starting, *full* Diesel or carburetor-type engines power these tractors. They are designed and built for continuous, heavy-duty service—and operate smoothly, with plenty of reserve power to pull out of the tight spots.

On the basis of performance, Internationals have hung up a record of leadership in the industrial field. Any International Industrial Power Distributor can substantiate this with performance charts and other data which will help you choose the power and equipment for the jobs you're bidding on.

Dependable after-sale service is provided all owners of Internationals by distributor and dealer organizations that span the continent and circle the globe. Factory replacement parts and equipment built for use with International Tractors and Power Units are available through these organizations. This assures maximum value and long term benefits for owners and operators everywhere.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue — Chicago 1, Illinois

Standards of Design For National Routes

(*Continued from preceding page*)

eliminated where justified on the basis of an economic analysis, giving proper weight to traffic delay, traffic hazard, and convenience. In all cases where it is reasonable to believe that future elimination of cross traffic at grade may be justified, sufficient right-of-way should be provided for the ultimate design. In all cases where cross traffic at grade is not eliminated, traffic-signal control installations, channelized intersections, or stop control on the cross roads should be provided.

Speed, Alignment, Sight Distance

The recommended design speeds are:

	Miles Per Hour	
	Minimum	Desirable
Rural sections		
Flat typography	60	70
Rolling topography	50	60
Mountainous topography	40	50
Urban sections	40	50

In the matter of alignment control, all curves sharper than 1 degree should be superelevated. All curves sharper than 2 degrees should be designed with approach transition curves. The following curvatures are recommended as consistent with design speeds:

Design Speed	Degree of Curvature	
	Maximum	Desirable
70 mph	4	3
60 mph	6	5
50 mph	9	7
40 mph	14	11

Sight distance commensurate with the type of highway and the design speed shall be provided. On two-lane highways, sections with sufficient sight distance for safe passing should be frequent enough to serve the intended purpose. Cost and topography must be analyzed jointly with the expected traffic volumes and likely speeds of vehicles in the design of safe passing sections. Where it is not practicable to provide frequent passing sections, consideration should be given to the provision of a four-lane highway instead.

The maximum gradients preferably should not exceed 5 per cent and in any case shall not exceed 6 per cent. On short lengths only, 7 per cent gradients may be used.

Types of Highways

Where the traffic density per lane is less than 200, the surfacing or pavement may be designed for 11-foot lanes. Where the traffic density is 200 or over, and in all urban areas, the pavement should be designed for 12-foot lanes. Where the traffic density, at present or anticipated upon completion of an improvement, is 500 or more, the initial improvement should be patterned to an ultimate highway development, and provision be made for the acquisition of the necessary right-of-way. Where the traffic density is 800 or more, a divided highway should be constructed.

The width of the median strip in rural areas should be a minimum of 15 feet, with 40 feet considered desirable; in urban areas, the minimum is 4 feet, with 12 feet the desirable width. Under special conditions, where economic considerations govern, a 2-foot median strip may be used, recognizing a 4-foot width as desirable. Curbs or other devices may be used where necessary to prevent traffic crossing the median strip.

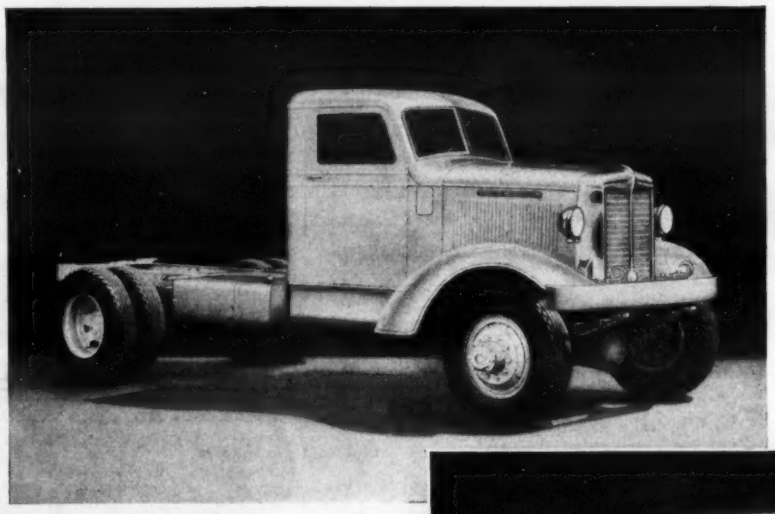
Where the traffic density is intermediate between that for a two-lane highway and that calling for a divided highway, three lanes may be used.

On a 45-mile contract for railroad bank restoration, ditching, cut widening and daylighting for the C. B. & Q. RR between Hardin and Billings, Mont., Stanley H. Artwright, Inc., of Billings, used a Caterpillar D8 and LeTourneau Carryall to spread material at the toe of the slope. Bank restoration along one side of about ½ mile of track is average 10-hour production.

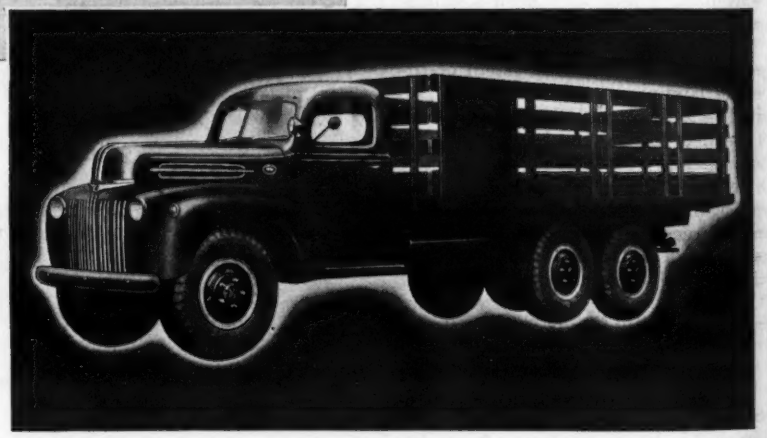
Shoulders and Slopes

Except in mountainous topography, shoulders shall be provided clear of the road surfacing for a minimum width of 10 feet, measured to the intersection of the shoulder and the side-slope planes. Such shoulders shall provide adequate

(*Concluded on next page*)



New, streamlined, improved models of Marmon-Herrington Heavy Duty *All-Wheel-Drives* with gross capacities up to 27,000 lbs., have up to 161" wheelbase, 131 h.p. in four-wheel-drive models. Also available in six-wheel-drive models. Easier, more positive steering, Westinghouse air brakes. New, roomier, more comfortable cabs.



As in the past, Marmon-Herrington converts all standard Fords to *All-Wheel-Drive*. Either four-wheel-drive or six-wheel-drive available in larger models. Gross load capacities up to 22,500 lbs. These are the lowest priced *All-Wheel-Drives* on the market.

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Marmon-Herrington *All-Wheel-Drives* are not "ordinary" trucks, in any sense of the word. Having power and traction applied through all four, or all six wheels, they do things other trucks cannot do, go places other trucks cannot go. If the job calls for ability to haul heavy loads *across country,* or to operate *off the highway,* as well as on paved roads, you need a Marmon-Herrington *All-Wheel-Drive.* If you need trucks that will keep going, through deep mud, sand or snow, or trucks that will climb unusually steep grades—*these* are the trucks for the job. Write for literature.

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Standards of Design For National Routes

(Continued from preceding page)

support for standing or disabled vehicles. In mountainous topography, an effective shoulder width of at least 4 feet shall be provided.

The side slopes shall not be steeper than 2:1 in cuts, except in solid rock or other special soils, and on fills except of rock or other special materials that may justify steeper slopes. On fills of 10 feet or less in height, the side slopes shall not be steeper than 4:1.

Right-of-Way

Rural-highway right-of-way of the following widths shall be either purchased or placed under public control through easement or other means:

	Width in Feet	
	Minimum	Desirable
Two-lane highways	120	220
Divided highways	150	250

On urban sections of the system, specific right-of-way widths are not recommended because of the widely varying conditions, but provision should be made for the acquisition of sufficient right-of-way for the ultimate design.

Culverts and Bridges

The clear width of all culverts, generally defined as structures of a length between abutments of 20 feet or less, shall be sufficient to carry the pavement, median strip, and shoulders without reduction and, as necessary, the continued slopes outside the shoulders.

All bridges shall be located to fit the overall alignment and profile. All structures shall be of steel, reinforced concrete, or masonry, designed for the AASHO H-20-S-16 load, and preferably of deck construction.

The clear height shall be at least 14 feet over the entire width of traffic lanes and at least 12½ feet over the effective shoulder width. The width of all bridges of a length between abutments of 80 feet or less shall equal the full roadway width, including the effective width of shoulders. On all bridges more than 80 feet long, between abutments, the width between the edge of the surfacing and the face of the curb preferably shall be 3 feet, and in all cases at least 2 feet. The face of the rail preferably shall be 4½ feet and in all cases at least 3½ feet outside the edge of the pavement. Sidewalks or safety walks shall be included on all structures where pedestrian traffic justifies.

The lateral clearance from the right edge of the pavement of the through-traffic lanes to the face of walls or to abutments and piers at underpasses shall be at least 6 feet. The lateral clearance between the left edge of the pavement and the face of a center pier or abutment shall be at least 4½ feet.

AASHO Design Policies

It is recommended that where they do not conflict with these standards, the practices and values of the seven AASHO design policies now approved and published be used in the design of highways on the Interstate System.

New Arc Electrode

A new shielded-arc electrode for groove butt joints and welding horizontal or flat fillets in the higher tensile steels has recently been announced by the Lincoln Electric Co., Cleveland 1, Ohio. Designated as Fleetweld 11-HT, this electrode is reported to have a number of new characteristics.

Field tests have shown that groove butt joints made with Fleetweld 11-HT are free of porosity, and fillet welds are smooth with a flat face. It has a low spatter loss, and welds are produced with a steady arc and are free from undercut, it is stated. The electrode may be used with either dc or ac; if dc is used the electrode should be negative. Fleetweld 11-HT, which conforms to American Welding Society specifications E-7020 and/or E-7030, is available in 3/16 and ¼-inch-diameter sizes, 18 inches long, and is shipped in standard containers of 50 pounds each.

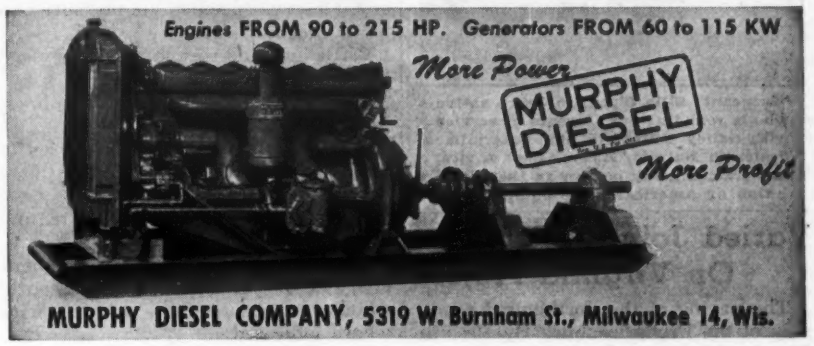
Further information on Fleetweld 11-HT and its applications may be secured direct from the manufacturer.

Highway Research Board Publishes Proceedings

Volume 24 of the "Proceedings" of the Highway Research Board, containing the papers which would have been presented at the 1944 annual meeting, if it had not been cancelled because of wartime travel restrictions, has recently been published. This 543 page volume contains discussions on highway economics, legislation and administration, right-of-way acquisition, and various aspects of the design of highway and airport pavements; the roadside-development committee report; reports on the durability of concrete, structural timber, methods of curing concrete, and traffic paints; the committee report on the pumping of concrete slabs; and discussions of various traffic and operations problems.

In addition, papers on the maintenance of joints in concrete pavements as related to the pumping of slabs have been brought out in bound mimeographed form. These contain the report of the committee and six papers on different phases of this subject.

Copies of the "Proceedings" are priced at $5.00 each while the papers on maintenance are $1.00 per copy. Both may be secured direct from the Highway Research Board, 2101 Constitution Ave., Washington, D. C.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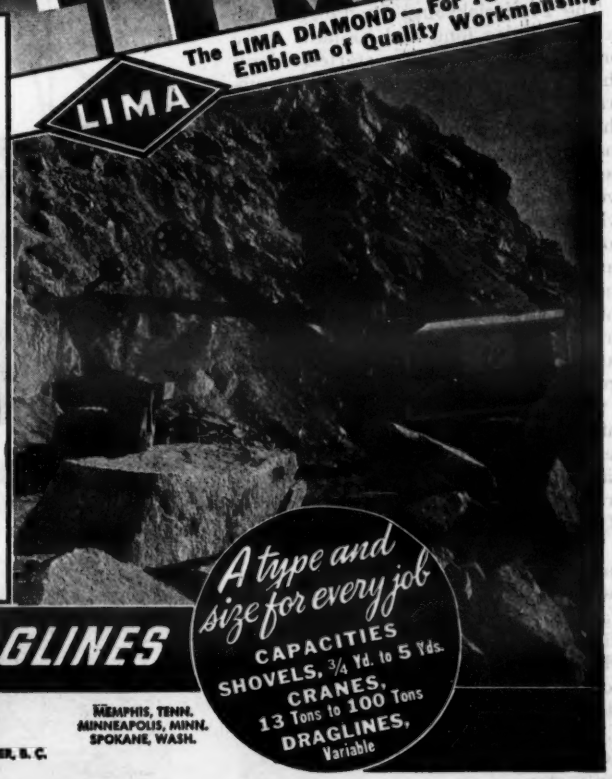

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"Sergeant" Silla O'ponk, a Jaluo native who is rounding out 19 years of service with Galley & Roberts Ltd., Caterpillar dealer in Nairobi, Kenya, East Africa, has trained many natives in the operation of American-made equipment.

Varied Joint Spacing On Virginia Project

The paving of the northbound roadway of the Fredericksburg By-Pass in Virginia is to include varied spacing of the contraction and expansion joints in an endeavor to determine the most advantageous spacing to prevent pavement cracking and the development of pumping at expansion joints. The project includes the new standard 6-inch subgrade treatment with granular material, such as coarse sand or gravel, and the results of these studies will be used in the design of future concrete paving.

The southbound roadway, completed late in the summer of 1945, has ¾-inch expansion joints of bituminous-impregnated felt spaced 90 feet apart and contraction joints 2½ inches deep and ¼ inch wide spaced 30 feet. The northbound roadway will be divided into three sections each approximately 6,000 feet long and each of these sections will have different spacings of the standard expansion and contraction joints.

On the first section, the contraction joints will be spaced 20 feet apart with the expansion joints at 500-foot intervals, and dowels and mesh reinforcing will be used throughout. In the second 6,000-foot section, the contraction joints will be spaced 25 feet apart and the expansion joints 1,000 feet apart, with dowels and reinforcing mesh throughout. In the third 6,000-foot section, the contraction joints will be spaced 30 feet apart and the expansion joints 1,500 feet, with dowels and mesh reinforcing. In a 500-foot section, dowels but no mesh will be used, while on another 500-foot section all reinforcing including dowels will be omitted.

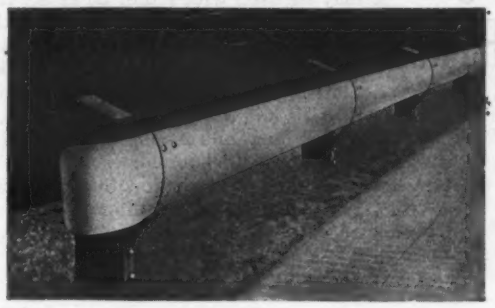
The Fredericksburg By-Pass, which is 4.161 miles long and contains three bridges, was actually started about three years ago with the grading contract. Then, because of war restrictions, the work was held up. At that time, the maximum grades were 5.8 per cent, but before the paving was started, these were all reduced to 5 per cent. There will be a minimum 4-foot median strip constructed and the 24-foot pavement on the southbound, or west, side laid 9 inches thick. The standard depressed median strip for this project is a 20-foot grass plot with a 5-foot 3-inch paved gutter in the center. This gutter will be constructed either of black-top or of 3 x 8 x 16-inch precast concrete blocks laid with broken joints. In one or two restricted areas it is necessary to eliminate the standard 20-foot depressed grass plot and use a raised median strip of a minimum 4-foot width.

The contract for the regrading and paving of the southbound highway was awarded to E. W. Heehler, Richmond, Va., by the Virginia Department of Highways on his bid of $158,874.19 which included the three small bridges. For the Department of Highways, C. W. Staggs was Resident Engineer, and C. E. Birch, Chief Inspector. Henry Howard was Superintendent for the contractor.

How to Break In Tires Made of Synthetic Rubber

Seven suggestions for breaking in new synthetic-rubber tires have been offered by the Maintenance Section, Highway Transport Department, Office of Defense Transportation:

1. Break in for at least one month under light loads, mounting new tires on the front wheels where possible before rotating to the rear wheels.
2. Observe specified air pressure and avoid bleeding tires.
3. Reduce and distribute the payload to avoid excess load.
4. Hold speed to 35 miles an hour or less.
5. After breaking in, rotate tires to more heavily loaded wheels and mate properly.
6. Measure actual tire sizes in mating for dual wheels.
7. Check sizes of mated tires about every 5,000 miles or once a month, whichever occurs first, and re-mate where indicated.



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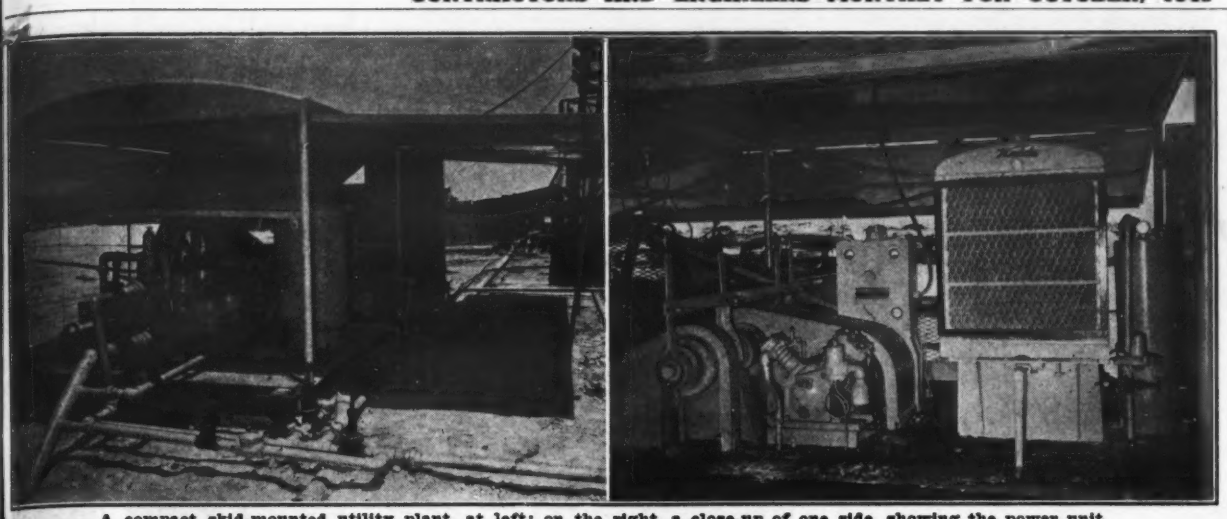

A compact skid-mounted utility plant, at left; on the right, a close-up of one side, showing the power unit.

Air, Electricity, Water From Portable Utility

A Southwestern Contractor Builds His Own Power Plant That Supplies All Camp Needs on Each Contract

FURNISHING current for lighting, compressed air, and pressure water supply are three of the so-called "public utilities" which the contractor frequently must provide for himself if he is to work to best advantage. To provide all these necessities, one contractor designed and has built an auxiliary unit which, mounted on a heavy skid, is readily transferred from job to job, and which is entirely self-contained.

Across one end of a 7-foot-wide skid is placed the internal-combustion engine which drives the various units. This may be run on diesel oil, gas, gasoline, or butane, as dictated by available fuels, and is set so that the intake air is drawn from below the roof, while the exhaust pipe is carried through the end panel above the hinged door sections.

Driven by V-belts from the engine shaft is a countershaft, equipped with individual clutches for each unit of the set-up. The jackshaft is set far enough away from the engine so that two units, a generator and an air compressor, are placed between the shaft and engine, while the high-pressure water pump and centrifugal unit for low-pressure supply are set outside the shaft line.

All pipe lines leading to and away from the unit are equipped with unions inside the wall limits of the house, so that the lines may be disconnected and the hinged sides pinned into place before shifting the power unit to a new location. The lines are all equipped with ells and drop legs so that the sides and end doors may be closed, except for a small crack to provide for the pipes, and the unit thus protected during inclement weather. The cracks around the doors admit enough air for the compressor and engine intakes, even when pulled against their frames.

To provide storage space for the wiring for the lighting circuits when changing location, an ingenious shelf is fitted within the house at the end in which is mounted the high-pressure pump system. Formed from angle irons and an expanded metal surface, the shelf is normally suspended up against the roof framing, but may be lowered on short chains to give additional space in which are laid the coils of conductor used to string lights around the job. The shelf may also be detached from its supporting chains and hooked to one side of the skid flooring, where it then forms an extended platform for keeping out of the dirt parts from whichever unit may be in process of overhauling.

The side panels, which are closed to form walls in bad weather or when shifting the unit, are swung upward and held in place by supporting rods hinged to the lower angle iron of the side panels, and fold in the clear when the house is closed. Short pins or dogs, sliding within matching holes in the side panels and the base channel iron of the skid, retain the panels in place and prevent distortion while loading the unit on a truck or trailer for shifting.

The floor of the unit is made from non-skid steel plates, welded to the channels and thus aiding in bracing the structure. The floor is heavy enough to provide anchorage for such units as the air receiver without supplemental bracing.

Instrument Co. Ready For Post-War Production

Continued full employment and maximum production are in effect at the Philadelphia plant of the Brown Instrument Co., manufacturer of electronic and similar recording instruments, according to a recent announcement by that company. Few reconversion problems had to be met, and economic studies, including wartime planning for peace, made it possible to avoid most if not all such problems.

Many technological improvements, induced and perfected by war requirements, are now available for post-war industry, and the company expects to maintain, and possibly to step up, its production to meet the expected heavy domestic and export demand.

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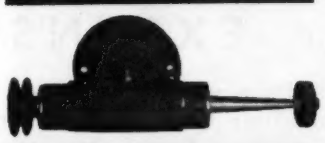
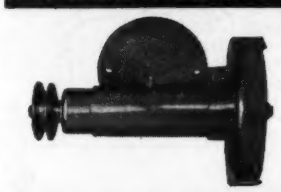


EXTERNAL GRINDER



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New Seaside Park On Coastal Island

State, County, and City Join In Plans for Construction Of Post-War Project; Land Now Being Acquired

✦ ALTHOUGH the state of Georgia has an appreciable length of coast line along the Atlantic Ocean, the State itself never has had an ocean-front park. This condition is being corrected as plans for the development of a seaside park on St. Simons Island off Brunswick in the southeastern part of the state are rapidly taking shape. The two interested local governments, Glynn County in which the park will be located and the nearby seaport city of Brunswick, have already allocated $50,000 to finance a portion of the site.

Quick action was urged in purchasing a strip of beach before private enterprise had developed the beach front so intensively that the cost of acquisition of a stretch of it for public use would be prohibitive. The Georgia Legislature has already authorized the State to investigate the possibilities of a state beach park and to proceed with its development.

St. Simons Island

In addition to Tybee Island on which Savannah Beach is located, there are, off this section of Georgia coast, six large semi-tropical islands known as the Golden Isles of Guale (pronounced Wally), called thusly by the Spanish missionaries who landed there in 1566, the year after the founding of St. Augustine, Fla. Guale was an old Indian chief who greeted the Spaniards on their arrival. Of the six isles, five are in private ownership and inaccessible to the public, but St. Simons, of which Sea Island is a part, is usually regarded as the most beautiful of the chain, and has always been divided into so many ownerships that no one has ever been able to consolidate it into a private estate and game preserve. Measuring nearly 12 miles long from north to south and 5 miles across at its widest point, the island was highly developed agriculturally before the War Between the States when almost all of its 19,000 odd acres were in cultivation.

Lying about half way between Savannah, Ga., and Jacksonville, Fla., St. Simons has one of the finest beaches on the Atlantic seaboard, and is the only one of the six islands that is joined to the mainland with a motor highway. Eight miles of causeway and bridges spanning three rivers and the marshes of Glynn County connect the island with the mainland at Brunswick. To use this road, motorists pay a toll of 40 cents for car and driver, and 10 cents for each additional passenger, with the revenue going to the St. Simons road fund which is controlled by the City of Brunswick and Glynn County and used for maintenance on this highway. Surplus money from the fund is to be used for purchasing the initial portion of the new park site.

Modest Beginning

The first strip of land to be acquired is 700 to 800 feet wide along 2,200 feet

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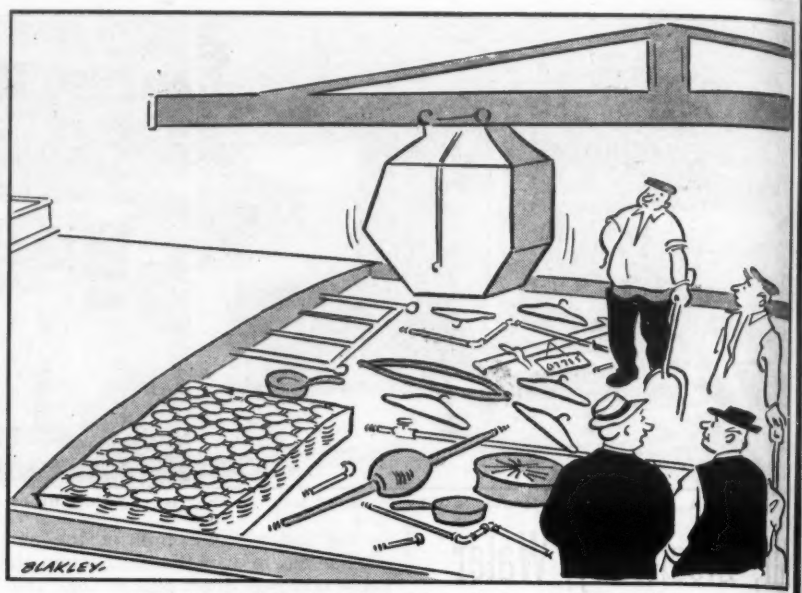

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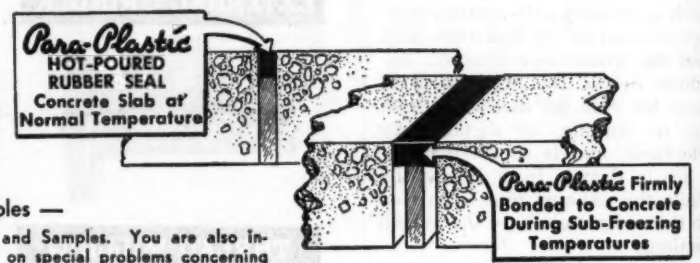

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Seaside Park Planned On Ga. Coastal Island

(*Continued from preceding page*)

of beach on the east or ocean side of the island between the King and Prince Hotel and the Coast Guard Station, which is about a mile north of St. Simons Village at the southern tip of the island. The parcels making up this area should be purchased through negotiations without too much difficulty, as the few dwellings located here are mostly small frame structures not too high in value. In the areas where there are no houses, the ground inland from the beach is characterized by dunes and thick beach grasses extending back to Ocean Boulevard, an oiled road running along the east shore of the island. On this 42-acre plot between the highway and the sea the oceanside park will have its beginning.

In order to make the park accessible and useful for a relatively modest sum, the initial development will be limited to the expenditure of $140,000 for the construction of a bath house, a section of boardwalk, drives, and a parking field for 200 cars. The bath house will be brick, painted white, with partitions of asbestos lumber, and will accommodate 1,200 or more persons per day. To the original $50,000, which the local governments have already advanced for outright purchases or options on the land, the State will add approximately $110,000 to acquire title to the entire 42-acre site.

The park will be operated by Glynn County on a non-profit basis, with a parking or admission fee charged to obtain revenue for maintenance and operation. With the expected increased popular use of the park, its facilities will be expanded and improved with the expenditure of $442,000 more. To the bath house will be added a 120 x 60-foot swimming pool, a children's wading pool, a cafeteria and restaurant. The parking area will be increased to accommodate 400 cars, and the boardwalk will be extended the length of the beach which will be from 100 to 150 feet wide at high tide.

Around the site a metal fence will be erected and the entire area will be graded and drained, permanent pavement laid, electric service lines installed, and sewer facilities added. A service building and a playground will be constructed and game equipment purchased; in another section of the park, picnic areas will be laid out.

Future Expansion

Inland and to the west of the park site are 267 acres of marshland which the State also plans to acquire as part of the oceanside park, making the total area 309 acres. Here in the summer of 1742 was fought the Battle of Bloody Marsh, when the Spaniards unsuccessfully attempted to regain St. Simons Island from the British under General James E. Oglethorpe. Along the western edge of the swamp ran an old pre-Revolutionary military road connecting Fort St. Simon, at the southern end of the island where the lighthouse now stands, and Fort Frederica 7 miles away on the western shore overlooking the Frederica River. The tabby ruins of this latter fort are still standing, attesting to the skill of those early builders and the stoutness of the local materials of construction—lime cement made from ground-up oyster shells bonding together the fine and coarse aggregate of sand and whole oyster shells into durable concrete. Over this old military road the State eventually expects to build a parkway connecting the historic fort and other parts of the island.

When the park is built, bus lines will converge on St. Simons from communities within a 75-mile radius of the island. The oceanside development will be available not only to Georgia residents but to vacationists and tourists to that area, who now are restricted to the limited facilities of the county bathing beach at the southern end of the island fronting on St. Simons Sound, across which lies privately owned Jekyll Island where a hundred of the nation's wealthiest men have a club and game preserve. On adjacent Sea Island to the north there is a splendid ocean-front beach but this is available only to members of the community or to guests of the Cloister Hotel and Apartments. Consequently a public bathing beach on state property will fill a long-felt need of Georgia to have an ocean-front park that can be enjoyed by everybody.

Preliminary plans for the first phase of construction in this development were prepared by Gilmore D. Clarke, Michael Rapuano, & Leslie G. Holleran, Consulting Engineers and Landscape Architects of New York City. Mr. Clarke has been consultant on several beach-park developments around Metropolitan New York and is also Dean of the College of Architecture at Cornell University. H. J. Friedman is Engineer-Director for the Commissioners of Roads and Revenue of Glynn County at Brunswick, Ga., and supervised the preliminary work.

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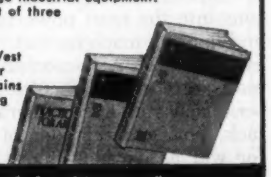

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Human Engineering; Its Place in the Future

The Scientific Analysis of Aptitudes Is Needed as Guide to Effective Use Of Individual Ability

By EDWARD D. EMERSON, LIEUT. COMMANDER, USNR, Bureau of Ships, Navy Department

✦ THE successful emergency training of millions of previously unskilled persons into the most powerful production and fighting machine that the world has ever seen was not accomplished without many attendant difficulties. The acute seriousness of our vulnerability to attack, and general lack of preparation for war as we now know it, called for national unity and effort unequalled in history. It is hoped that the lessons learned in this trial by fire will be the foundation of constructive improvements in our national economy leading to a better guarantee for security and peace. It will be necessary to conserve our dwindling supply of raw materials and, most important of all, to encourage and provide basic training for our young people along realistic lines of maximum usefulness in the event of future need.

This latter effort must originate from more extensive use of aptitude studies, a scientific analysis of individual capacities for effective performance over a wide field of human endeavor. For want of a better term, and to avoid some of the presently frightening medical designations, application of this relatively unknown but vitally important new science might be called "Human Engineering".

The cumulative effect of mass guess work in the education and training of our people has been conspicuous on both the fighting and production fronts. Misfits in all categories have been assigned to many posts of major and minor responsibility. It has been exceedingly difficult to effect personnel changes that would lead to greater efficiency during actual operations. The mandatory high tempo of activity and the large-scale need for specific services were too great for appropriate care in the designation of individuals for duty or station in the time available. Our war experience in the use of manpower, however, should provide a vast reservoir of information for future guidance in elementary and essential instruction.

We are all familiar with countless cases of mistaken choices in a vocation based on student opinion, early inclinations, or parental direction which are discovered later in life only when failure has resulted. We have also observed highly trained men, financially successful in their profession, realizing too late in their career that other fields of endeavor would have been more suitable and enjoyable. The necessity and advantages of a scientific, informed, and voluntary approach to a solution of this problem should be obvious to all.

Aptitude Studies

Considerable progress has been made during the last quarter century in developing the various techniques involved in the investigation of individual aptitudes. Psychiatric and psychological observations, I. Q. tests, mechanical-dexterity studies, etc., are standard procedures in some areas of the country, particularly in certain progressive schools and efficiently operated large commercial companies. Wider emphasis upon elective courses in secondary schools and colleges has helped many students to concentrate on training of their own choice.

Unfortunately the scope of this activity has been limited to a small percentage of our people and, further, its ultimate effectiveness has been minimized by a lack of follow-up or coordination of data determined as to the capabilities of the individuals. If a broad program backed by public interest and support could be adopted and placed in operation, it would be possible for any person to accumulate a record of observations as to aptitudes concurrently with education in any chosen field. Such data would be of incalculable value to the individual and prospective employers or to the armed forces in any future national emergency.

The details of placing such a project in operation could properly be fitted into our excellent and extensive educational system. In the case of many individuals, it is possible to establish specific traits and prospective skills very early in life. Continuous aptitude study verified by frequent re-checks should be carried out by competent, neutral, trained specialists available to all. Judgment and advice as to appropriate courses of instruction must be tempered with balanced consideration as to heredity, prospective environment, and physical attributes or liabilities. It is believed essential that the student and parents be made familiar

(*Concluded on next page*)

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Human Engineering; Its Place in the Future

(*Continued from preceding page*)

with the findings of observers, so that reformed adjustments can be made at any time during the progress of training. New methods of instruction developed to a high degree in our war effort can be applied generally to offset the present uneven distribution of first-class educational facilities. Sound motion pictures and recordings make the services of the world's best teachers available to any locality, however remote.

Our democratic way of life, with free choice of activity, has proved its permanent advantages over any system of regimentation. However, in time of national emergency, we found ourselves poorly equipped to carry out the disagreeable but mandatory task of waging total war. This situation adds up to the need for early specialization based on scientific selection of proper training for life's work, so that an individual can function as a useful citizen by an expenditure of minimum effort, leaving other time free for cultural advancement, hobbies, or recreation. We are now able to produce much more than we need so that a labor surplus is inevitable. If our productive and cultural effort can be guided into channels of maximum permanent benefit to the nation as a whole, our prestige and position as a world power can be maintained and strengthened.

More Knowledge Needed

It is suggested that a gradual program of change be initiated by dissemination of information as to the advantages of scientic approach to this problem. Forward-looking cooperative institutions might be encouraged to publish data and records from experience accumulated. Much additional research is needed, and the supervision of this work might very well be an attractive and useful profession for some of our exceptionally talented young people. The workings of the human body and mind are still among the least understood of all familiar surroundings.

Our outstanding success in prosecuting the vast global conflict which we are now completing has been due to our possession of almost unlimited natural resources, and superior basic training of our civilian and armed forces. There is little reason for us to rest on our laurels, however, as nations, like individuals, are not static; they either improve or vegetate. Any progress we make towards the solution of this complex and universal problem will be a good example for the whole world to follow.

New Rubber Compound To Seal Road Joints

A new joint-sealing compound containing rubber, asphalt, and other ingredients combined to form a positive seal for expansion joints has been announced by the Highway & Airfield Materials Department of The Philip Carey Mfg. Co., Lockland, Cincinnati, Ohio. Foremost among the advantages claimed for this hot-poured rubber-asphalt compound, known as Careylastic, is the bond that is obtained. It is reported that throughout the entire range of annual temperatures this water-tight seal gives protection considerably in excess of all known specification requirements.

Careylastic is said to provide a flexible bond which retains its resiliency and cohesion while permitting the normal compression and recovery of the non-extruding fiber joint filler. The lack of extrusion eliminates expensive annual costs of cleaning and repouring. The method of heating and installing Careylastic is identical with the procedure followed in the application of ordinary filler asphalt.

Complete information on this newest product of the Carey line, which includes subgrade felt, asphalt crack filler, and asphalt and fiber expansion joints, may be secured direct from the manufacturer by mentioning this item.

Concrete-Mixer Catalog

A new 12-page catalog illustrates every important construction feature of the Kwik-Mix 16-S Dandie Mixer, including the tilted flow-line discharge chute and the selective skip shaker. This 3-bag unit is one of the new line of concrete mixers recently put on the market by the Kwik-Mix Co., Port Washington, Wis., and recently described in this publication.

Copies of the catalog are available upon application to the manufacturer and reference to this brief review.

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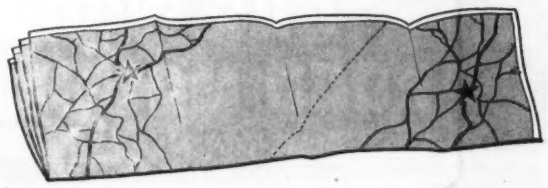
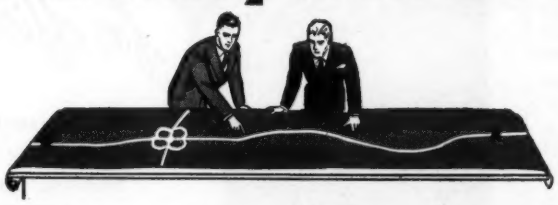
Look at the places where highways



haven't been built.

Some of those yet-to-be-built roads will be your jobs.



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Raymond F. Day, CCM, USNR, author of our series of articles on Seabee activities in the Pacific.

Seabees Use Gravity At Bituminous Plant

(*Continued from page 2*)

cline, after which the home-made swinging frame is moved by a Seabee to bring each barrel over a 10,000-gallon receiving tank, where the bitumen gets its first heating.

The Seabees also rigged up a "flame thrower" . . . that's what they call it . . . which uses fuel oil and compressed air and develops intense heat. The Seabees use this torch to heat the sides of each drum of asphalt as it hangs suspended over the storage tank. Up to 30 drums an hour can be handled by this method.

Asphalt passes all the way to the last stage by gravity. Storage tanks are 10 feet lower than the heating tank. Steam circulates through coils in the heating tank, and through two 20,000-gallon storage tanks. The only asphalt pump in the entire system is the one which transfers bitumen from the last storage tank to the pugmill.

It is almost impossible to estimate how much the efficiency of the asphalt handling in this plant, as well as the economical use of steam, was built up by field-improvised insulation. The steam is furnished at the plant by a battery of six Cleaver-Brooks Model DS 3-1 tank-car heaters, with about 100 psi of steam maintained. Steam lines, designed to operate without being insulated, were covered with sheet-metal jackets allowing about 1 inch of sand to be placed around the lines. Asphalt tanks were surrounded by lumber frames, contained in metal hoops, and 4 inches of sand insulates the sides of each steel asphalt tank. Officials estimate that most of the heat which ordinarily would be lost by radiation is retained by this material. It is now easy to secure and hold proper asphalt temperature, and that was a difficult job before the insulation was installed.

The morning the job was visited for CONTRACTORS AND ENGINEERS MONTHLY, the chief engineer was giving his firemen some indoctrination the hard way.

"I'll teach these guys something about economical operation, so they can hold a job when they get out of here, if it's the last thing I ever do," he said.

It seemed that his men had requisitioned a new supply of petcocks, globe valves, and various steam fittings, junking those valves which had caked up. The chief got a can of emery paste, some emery cloth, and a couple of wrenches, and set all hands to grinding. The calcium cake was removed from moving cocks and valve stems, and they were reconditioned by lapping them with valve-grinding compound. It was very apparent that this chief was demonstrating something not many of the men had seen before.

Adjustments as Needed

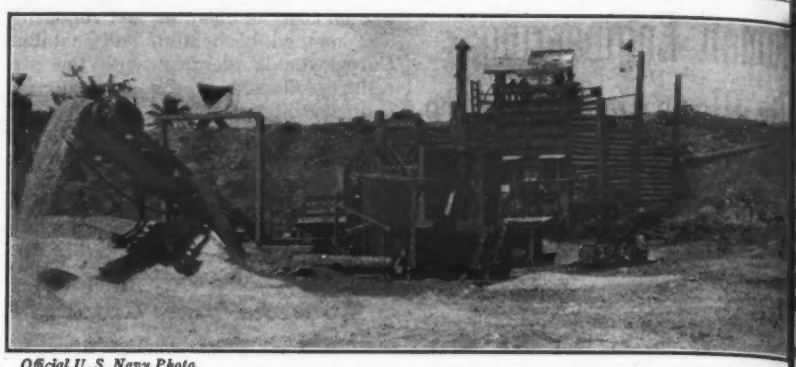
In order to batch a constant mix, it is necessary to make periodic adjustments, both on the asphalt plant and on the roll crushers. Adjustments on the crushers are usually made if the percentage of fines runs 10 per cent of the allowable mix design. Screen analysis tests are made constantly. According to the officer in local charge, downtime chargeable to rock-plant adjustment is nil. Total down-time because of breakdowns and all mechanical troubles is less than 5 per cent, an outstandingly low figure by any standard. And this plant has passed the 100,000-ton mark in production!

A batch-plant rock sample was made while the job was visited, and is listed as follows:

Screen Size	Retained Weight Grams	Per Cent Retained	Per Cent Passing
¾-inch	169	9	91
No. 4	989	54	46
No. 10	1,319	72	28
No. 40	1,579	87	13
No. 60	1,668	92	8
No. 200	1,744	96	4

Total weight of sample, 1,820 grams.

This sample was a little on the coarse side, but was within the acceptable limits of variation.



Official U. S. Navy Photo

Starting from the receiving hopper on the hillside, rock passes through this crushing and screening plant to a surge pile whence it moves by conveyor to the asphalt plant.

If the finished bituminous mix does not come out of the plant properly processed, as sometimes happens in the best of plants, the Seabees run through a repertoire of adjustments. The first two mentioned generally cure the trouble, and result in a uniform mix with an even coat of asphalt on each aggregate particle.

(a) They raise the pugmill discharge dam, thus holding the mix a bit longer in the pugmill, resulting in more thorough distribution of bitumen.

(b) The heat of aggregate is increased.

(c) The heat of asphalt is increased.

(*Concluded on next page*)

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Seabees Use Gravity At Bituminous Plant

(Continued from preceding page)

...ering its viscosity.

(d) Gate settings are changed.

(e) The percentage of bitumen is in...reased, but this action is taken only ...ter the other adjustments have failed ...o produce the desired results. Never ...as the percentage of bitumen exceeded ...7 per cent by volume.

(f) The percentage of fines is de...reased, or increased, by adjustment of ...he settings of the roll crushers. Usually ...djustment at the final roll crusher only ...s required.

A 315 and a 500-cfm air compressor ...urnish air for use around the plant, ...nd a 75-kw portable Caterpillar-...driven generator furnishes lights and ...power.

Placing the Mix

The finished mix is dumped into a fleet of Diamond T 4-ton end-dump trucks. Hauls vary from 500 yards to 21 miles, but in most cases the outside temperature is warm enough so that the loads are not covered. After the mix is delivered to the job, it is spread to a compacted thickness of 2½ inches on roads, and 2 inches on airfields. Barber-Greene finishers are generally used. Compaction consists of breaking down the bituminous mix, and then ironing it with 11-ton rollers, sometimes for 4 or 5 hours, until it will no longer "give".

The subgrade, as stated before, is usually so good that the mix can't miss. Nine months after the first asphalt roads went in service on this base, there were very few signs of failure, and these were all minor. The asphalt paving which has been laid from this plant has already taken up to 28 inches of rainfall and enough heavy military traffic to stagger the imagination.

Index to ASTM Standards

Supplementing the 1944 Book of ASTM Standards, the American Society for Testing Materials has issued a new index as of December, 1944, which offers quick reference to the more than 1,200 standard specifications and tests, including tentative standards, published by the Society. All items are listed under appropriate key words according to the subjects covered, and an added convenience is the list, arranged in numeric sequence, of all ASTM serial designations.

Copies of the 220-page "Index to ASTM Standards" may be secured without charge by writing to the American Society for Testing Materials, 260 So. Broad St., Philadelphia 2, Pa.

Eighth Welding Handbook Has New Data on Process

Entirely revised to include the latest data on new arc welding methods and equipment, the eighth edition of the "Procedure Handbook of Arc Welding Design and Practice" has just been announced. The volume, containing 1,312 pages and 1,647 illustrations, including photos and drawings, incorporates a wealth of new information on recent wartime developments of welding methods and techniques which makes obsolete much previous literature on the subject.

In addition to standard data on welding symbols, speeds and costs, characteristics of metals, preheating, stress relieving, approach to welded design, and other pertinent information, the newly revised handbook also includes new cost tables, new welding techniques, mathematical calculations for new weld-designed structures, the latest steel specifications of SAE and AISI, discussion of underwater cutting, shop ventilation, maintenance of welding equipment, methods of testing, and filler metal specifications for arc welding electrodes.

Copies of the new "Procedure Handbook of Arc Welding Design and Practice," which is 6 x 9 inches in size with semi-flexible simulated-leather binding, may be secured direct from Lincoln Electric Co., Cleveland 1, Ohio. Price: $1.50 per copy, postpaid in the United States; elsewhere $2.00 per copy.

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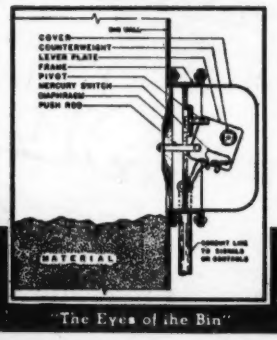

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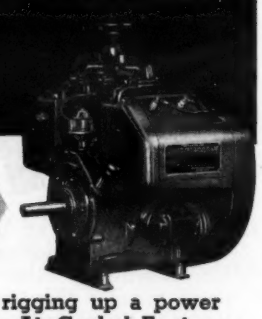

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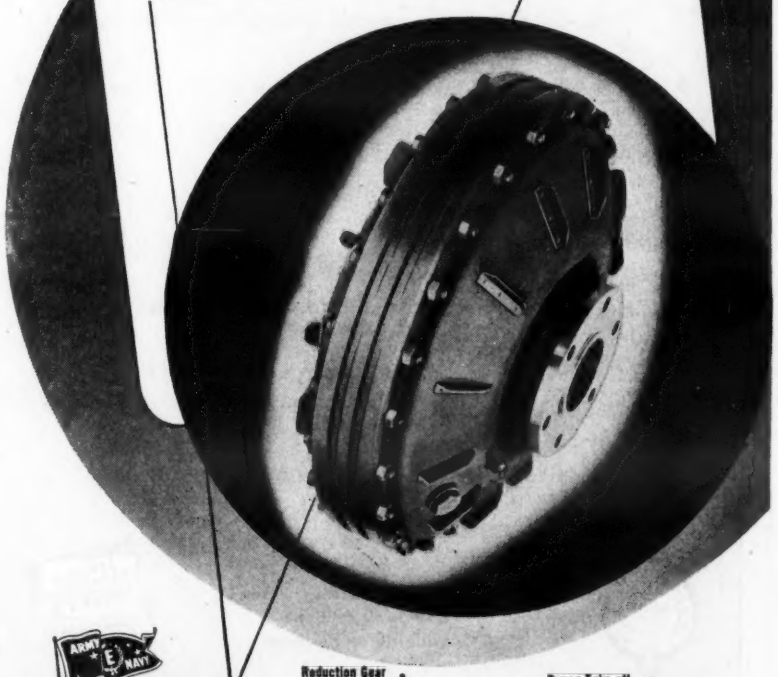

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Machine Tool Clutch
SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

Palisades Parkway Plans Progressing

Plans for the proposed Palisades Interstate Parkway, from the New Jersey end of the George Washington Bridge across the Hudson River to the Bear Mountain area in New York State, are making progress. The New York State section has been divided into two parts: from the New Jersey state line to Route 202 at Mt. Ivy, for which field information and preparation of plans have been let by contract to Ammann & Combs of New York City; and the section from Mt. Ivy to the Bear Mountain area, for which the Poughkeepsie District of the New York State Department of Public Works is doing the field work and preparing the plans.

The section from the New Jersey line to Mt. Ivy is approximately 14 miles long, and the contract engineers are making good progress. Subsurface investigations are under way, and are being carried on simultaneously with other surveys and office design. This project is about 20 per cent complete.

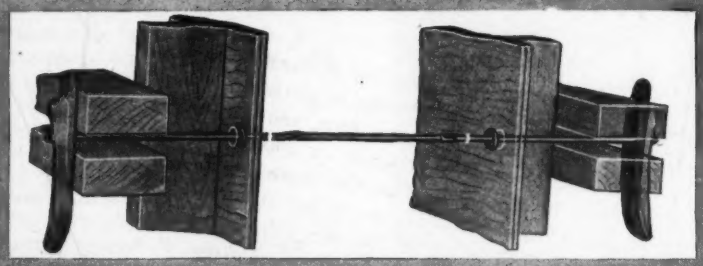
The upper section is about 16 miles in length and preliminary surveys for field investigations, except for structures, are about 85 per cent complete. Structure surveys and investigation of subsurface conditions are in progress. It is expected that the first contract operations will involve grading and structures, to be followed by subsequent contracts for paving and landscaping. Grading plans for the upper section are well over half completed.

Both field and office work on both sections of the New York State portion of the Parkway are being carried on as rapidly as possible to provide for early construction of the project.

Well Known Tractor Representative Killed

Lloyd Sumner Burdick, District Representative for Caterpillar Tractor Co. in North Dakota, Montana, Alberta, and Saskatchewan, was killed on August 9 when two sections of the train, the Empire Builder, collided at Michigan, N. D. Mr. Burdick was a graduate of the University of Illinois, attended Law School at the University of Detroit and University of Michigan, and joined the Caterpillar Sales Department in 1935. From 1939 to 1942 he was associated with the William H. Ziegler Co., Caterpillar distributor at Minneapolis, and then joined the U. S. Engineer Corps to serve as a mechanical engineer throughout the Northwest and on the Alaska Highway. He returned to Caterpillar in 1944 as District Representative.

RICHMOND SNAP-TYS SPEED Light Concrete Wall Form Construction



Richmond Snap-Tys are 3,000 lb. safe load tie units designed particularly for light foundation wall form work. The tie shown above is 1" break type with flat spreader washers. Metal cone ¼" break type and Wood cone 1" 1½" or 2" break type are also available.

Richmond Snap-Tys assure:

Form work—Secured straight and true to line.

Spreading action—Forms spaced by tie for correct wall thickness.

Wall finish—to specification—tie metal set back, as required.

Elimination of Wood spreaders.

Economy of operation.

100,000 sold 1933 *6 Million sold 1940*
Over 10 Million sold 1942

- RICHMOND OFFERS—consultation on best types of forms and ties for a given job.
- RICHMOND SNAP-TYS are packed in CARTONS.
- RICHMOND TYHOLDERS—known as "Working Parts", are furnished.
- RETURNABLE FOR FULL CREDIT—no rentals charged.

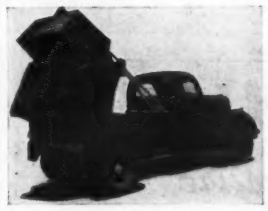
Form-Ty Engineering Guide and Snap-Ty Book Available on Request

SEE OUR CATALOG IN SWEET'S

RICHMOND SCREW ANCHOR COMPANY, INC.
816 LIBERTY AVENUE, BROOKLYN, N. Y.
MANUFACTURING SINCE 1911

World's Most Versatile Unit

Brooks LOAD LUGGER *for Handling Materials*



Enclosed Type Container may be used handling refuse or wet materials.

Here's new speed and efficiency in moving materials on hand loading jobs. Mount a Load Lugger on any standard truck chassis and use 5 to 10 dump buckets. It cuts costs in quarry operations, stripping overburden, road building and scores of hauling jobs. Ask for Catalog.

TrucKrane Boom Attachment may be used for lifting or placing pipe, etc.

710 Davenport Road, Knoxville 8, Tenn.
Distributors in all Principal Cities

Brooks EQUIPMENT AND MFG. CO.

24 HOUR SERVICE

The "top" men at Insley know what it costs in dollars and cents for "down-time" due to lack of parts because they once "sat in the cab" themselves.

That's why these men who build Insley Excavators now make this pledge to every owner of an Insley Excavator: that at least 96% of all replacement parts orders for Insley equipment will be shipped the same day as received.

Yes, these men know the true meaning of prompt service . . . and they also know what it takes for *low-cost yardage*. "What it takes" you'll find in Insley Excavators.

With wartime manufacturing facilities now devoted entirely to civilian production, you are assured of early delivery on a new Insley Excavator. Two sizes, ⅜ and ½-yd. . . . five interchangeable attachments . . . rubber, crawler or rail-mounted . . . gasoline, diesel or electric-powered.

EXCAVATORS
INSLEY
CONCRETE EQUIPMENT

INSLEY MANUFACTURING CORP., INDIANAPOLIS 6, IND.

Radio Communication Will Aid in Road Work

Usefulness in Emergencies Has Been Proved; Will Be Expanded to Both Construction and Maintenance on State and County Systems

MODERN systems of communication will go hand in hand in the construction and maintenance of modern highways, H. A. Radzikowski, Maintenance Engineer, Public Roads Administration, points out in an article "Radio on the Roads" in a recent issue of *American Highways*, published by the American Association of State Highway Officials. The effectiveness of radio communication in the prompt dispatching and direction of repair crews along the highway during emergencies has already been demonstrated, and the Federal Communications Commission recently allocated sixteen radio channels for the separate use of special emergency services which include state and county highway departments.

State Highway Dept. Plans

Mr. Radzikowski reports that a recent survey indicates that thirty-two state highway departments are using or contemplate the use of radio in connection with highway maintenance. Nine states, California, Georgia, Kansas, Missouri, Ohio, Oregon, Utah, Washington, and Wyoming, are already using radio in varying degrees, generally through police facilities, while Alabama, Arizona, Arkansas, Colorado, Connecticut, Idaho, Illinois, Kentucky, Louisiana, Massachusetts, Michigan, Montana, Nebraska, Nevada, New Hampshire, New York, Oklahoma, Pennsylvania, Rhode Island, South Dakota, Texas, Vermont, and Virginia are considering the use of radio for state highway department work. Definite plans, however, have been awaiting the time when full advantage could be taken of the advanced radio technique developed during the war.

Use by Counties

Several counties were reported to have expressed an interest in two-way voice communication by radio. Its most obvious use is in winter maintenance, for the efficient direction of snow-removal units and the prompt reporting of any difficulties by the road crews. This is particularly important in rural and non-populated areas where telephones are scarce, and contact with the units working on the roads infrequent. In addition, winter road conditions reported to the highway department central office by radio may be quickly broadcast by commercial stations, to direct motorists away from blocked roads and to discourage road use during a storm.

However, Mr. Radzikowski reports that the use of radio by maintenance forces is not confined to the winter months. Prevention of excessive erosion and washouts during heavy rains through the prompt dispatching of equipment to clear debris washed against openings of drainage facilities, prompt attention to slides and floods, and the establishment of detours have prevented accidents and traffic delays.

Broader Use of Radio

The allocated radio frequencies which will be available to highway departments are to be limited to "emergency" use. An extension of such use for dispatching equipment to repair surfaces, shoulders, and warning signs on high-speed highways and for the more general transaction of business in rural areas would increase the efficiency of maintenance performance, secure safer traffic service, and justify the investment in radio.

(*Concluded on next page*)

You can do the job faster ...with extra savings in time and money when you use a LEROI Portable Air Compressor

A model 60 Le Roi Compressor speeds this residential sewer job.

WHEN you've got to work at top speed to keep ahead of fast-moving schedules, you appreciate the extra mobility of Le Roi compressors — and the dependable qualities built into every one.

Foremost among many features is the coordinated action between engine and compressor, eliminating costly vibration and resulting in greater efficiency. Because both engine and compressor are built to the precision standards of an engine builder, you get greater smoothness that results in longer life — controlled speed that is economical, yet keeps a constant supply of air on hand — and dependable performance that pays off in service and satisfaction. 60 to 315 c.f.m.—gasoline-powered and 105 to 500 c.f.m. Diesel-powered.

See your nearby Le Roi distributor or write for bulletins.

C-71

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1714 S. 68th STREET • MILWAUKEE 14, WISCONSIN

Distributors Located in Principal Cities

LE ROI MILWAUKEE

A BETTER METHOD OF HOLDING WIRE ROPE *Securely!*

MILLIONS IN DAILY USE BY THE ARMED FORCES AND THOUSANDS OF MANUFACTURERS

SAFE-LINE WIRE ROPE CLAMP

Eliminates Splicing and Serving

Much faster—saves time—reduces cost. Minimizes rope or sling breakage. Holds tight thimble.

Easy to Use, Easy to Re-adjust

No highly skilled labor or special tools required. Easy to adjust as rigging stretches.

Outpulls Strongest Rope

¾" 6 x 19 Improved Plow Steel Wire Rope broke at 46,850 pounds on Riehle Testing Machine. SAFE-LINE Clamp *held.*

Economical—Use Many Times

Thousands of the first SAFE-LINE Wire Rope Clamps made are still in use. Low initial cost.

Prevents Injury, Mental Hazards

Exposed needle-sharp wire ends safely enclosed inside of clamp protects against cutting or scratching hands and arms. Smooth rounded shape prevents catching clothing or fouling.

Replacement Guarantee

Every SAFE-LINE Wire Rope Clamp carries a replacement guarantee against breakage and fracture.

FOR ROPE SIZES ⅛" TO ¾"

APPROVED BY UNDERWRITERS LABORATORIES

APPROVED BY CIVIL AERONAUTICS ADMINISTRATION

Never Slips

FORGED AND MASTER COINED TO FIT ROPE

Double spiral splines fit each wire and strand, provide a perfect, secure GRIP on rope. Pressure equally distributed over large area eliminates cutting action. Locking lugs automatically line-up threads.

WRITE FOR DESCRIPTIVE PRICE LIST FOLDER

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CARRYHAUL

Trade Mark Registered

FOR TRAILING EQUIPMENT 'CROSS TOWN OR 'CROSS-COUNTRY..WITH ECONOMY

There's a proper size of safe, easy-loading MARTIN TRAILER to hustle light equipment 'cross town —or to highball a giant D8-Dozer 'cross-country—with economy.

Your "CATERPILLAR" Dealer is your MARTIN Dealer. See him for your trailer needs.

Write for Booklet

MANY MARTIN MODELS 5 TO 20 TON CAPACITY

MARTIN MACHINE COMPANY

KEWANEE, ILLINOIS

★ Buy Victory Bonds

★ Save Waste Paper

★ Turn in Scrap Metal

★ Be a Blood Donor

★ Pay only ceiling Prices

Radio Communication Will Aid in Road Work

(*Continued from preceding page*)

The utility companies have asked the FCC for authority to broaden the use of radio for their purposes. It appears that a similar course may be followed by a representative group of highway departments through the presentation of a brief which would explain the need for such an expansion of the use of radio.

Use in Construction

The FCC made special provision for a citizens' radio communication service by setting aside a band in the radio spectrum for this purpose. Mr. Radzikowski envisages such a service used by contractors in communications to and from trucks, tractors, and other mobile units operating on extensive construction projects. It should be especially helpful in the erection of bridges over large bodies of water and in synchronizing the movement of supplies and equipment with the needs of the working forces at the construction site.

Use on Expressways

Repeater stations on the Pennsylvania Turnpike have extended the communication range to cover the entire 161 miles of expressway. The $300,000 radio system provides two-way communication between toll booths at ten interchanges, six maintenance buildings, portals of seven tunnels, turnpike patrol headquarters, mobile units traversing the highway, and distant offices of the state police. Road maintenance, accident handling, and traffic control are thus coordinated by two-way radio equipment.

Conclusion

The use of radio during the war has brought about very rapid advances in its development, and its usefulness can be greatly expanded in the highway and transportation field. However, further studies must be made on its proposed uses, with a view to furnishing a report to the FCC which will reflect the views of the highway departments and secure permission for broader use of radio for this purpose.

Vitrified-Clay Pipe And Fittings Described

A new 12-page booklet entitled "Standard Vitrified-Clay Pipe and Fittings" has recently been issued by the Clay Sewer Pipe Assn., Inc., 50 W. Broad St., Columbus 15, Ohio. The pipe and fittings covered include those produced and stocked for normal distribution as standard items, in accordance with the cooperative agreement between the members of the Association and the U. S. Bureau of Standards. In addition to a statement in regard to these standards, the booklet includes photos and cross sections of the various items, with tables of sizes and other pertinent information.

Copies may be secured by those interested by writing direct to the Clay Sewer Pipe Association on their business letterhead and mentioning this item.

Harco Changes Name

The Harco Steel Construction Co., Elizabeth, N. J., manufacturer of easy-to-erect towers and masts, has changed its name to Harco Tower Inc. Its location and products remain the same.

POURING CONCRETE UP HILL!

● Smith-Mobile Truck Mixer provides a fast, controlled discharge *even when the machine is on a steep incline.* The patented T-shaped blades scoop up the thoroughly mixed concrete and carry it swiftly to the discharge opening, without segregation. The speed of the drum controls the speed of discharge and a smooth steady flow results, even on an up-grade.

Smith was the FIRST truck mixer manufacturer to introduce a HIGH DISCHARGE model, eliminating the need for a rear-end hoist with its original extra cost, dead load and maintenance expense. And Smith-Mobile pioneered many other time-tested truck mixer features. It will pay you to investigate. Write today for Catalog No. 198-C.

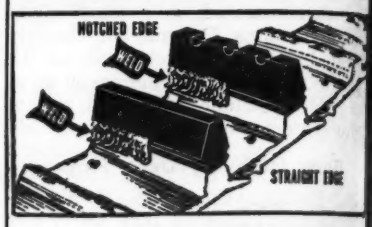
The T. L. SMITH CO., 2857 N. 32nd St., Milwaukee 10, Wis.

The illustration above shows a No. 4 Smith-Mobile, one of a fleet operated by Western Concrete and Equipment Company and used in the construction of a Southern California war plant. This Smith-Mobile is discharging concrete into a high floor hopper. The ramp is a 14° grade and the axis of the mixer drum is 18° from horizontal — yet the speed of discharge is NOT seriously affected by this steep incline.

SMITH-MOBILE

The ORIGINAL HIGH DISCHARGE Truck Mixer and Agitator

Rebuild your TRACTOR GROUSERS WITH BULLDOG Grip-Lugs



Easily Welded

ECONOMICAL GIVES MORE PULLING POWER

See your local Equipment Dealer

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ALLIED STEEL PRODUCTS, Inc.
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SALESMAN WANTED

By newly established Massachusetts distributor of nationally-known equipment. Applicant must furnish written information before interview, giving full particulars regarding education, experience, and detailed qualifications. Only experienced men capable of earning $20,000 or more per year need apply.

Write

United Equipment Corporation
Temporary address, 500 Statler Office Bldg.
Boston 16, Massachusetts

Buy all the bonds you can . . .

Keep all the bonds you buy . . .

★

Buy all the Victory Bonds you can. Hang on to them. Because it's such good sense, and because you will help consolidate the Victory.

★

Buy Victory Bonds

Old Road Resurfaced As Wartime Stop-Gap

Cold-Laid Plant-Mix Was Placed by State to Carry Heavy Traffic Until the Relocation Is Completed

TWENTY-EIGHT miles of U. S. 11 in west-central Alabama was recently given a new bituminous surface by state maintenance forces from a point where a new highway location (see page 1) leaves the old, a few miles east of Tuscaloosa, to where it meets State Route 5 at Bucksville. This 18-foot concrete road of 9-6-9-inch section with expansion joints every 50 feet was in very poor condition due to the heavy wartime traffic it had been carrying, and had some very badly broken areas. In these sections the concrete was removed and replaced with sand or coarse gravel. Other disintegrated areas were patched with plant-mix bituminous material.

Initial Surface Treatment

With the worst places thus taken care of, a single surface treatment was applied to the length of the job. This consisted of 0.42 gallon of RT-11 tar to the square yard, applied the full pavement width by a Standard Steel Works 850-gallon distributor mounted on a 2½-ton Mack truck. A cover coat of slag, graded from ⅜ inch to 1¼ inches, was then laid at the rate of ½ cubic foot to the square yard by a fleet of eleven Ford and Dodge trucks equipped with spreader boxes. As the spreader boxes were 7 feet wide, a lane on each side of the road was covered first, after which the boxes were blocked off to reduce their width to 4 feet for covering the remaining strip down the center. The surface was next rolled by a Bros rubber-tire roller pulled by a McCormick-Deering rubber-tired tractor and then opened to traffic which completed rolling.

Tar for the seal coat came from the Koppers Co. Woodward plant near Birmingham, and was shipped 30 miles over the L & N railroad to a siding at Abernant adjacent to the road. The tar was heated in the tank car to a temperature of 175 to 200 degrees F by a portable coal-burning boiler and transferred to the distributor by its own pump.

The slag was purchased from the Birmingham Slag Co. and shipped from its plant at Fairfield, Ala., 40 miles over the same railroad to the same siding as the tar. A pit was dug under the railroad siding so that the slag poured out from the hopper-bottom car onto a belt conveyor belt which loaded it on the trucks for stockpiling at convenient locations along the road. When ready for use, an Eagle loader, mounted on a truck for mobility, filled the trucks with the cover-coat slag from the various stockpiles.

Plant-Mix Course

Between four days and two weeks after the surface treatment, the road was cleaned with a blower and sweeper pulled by the McCormick-Deering tractor, and given a tack coat of 0.05 gallon of RC-2 asphalt, 250 to 300 viscosity at 120 degrees F, to the square yard by the distributor, using an 18-foot spray bar. This was in preparation for the bituminous plant-mix which was then laid in two layers, a leveling and a surface course.

The plant-mix, which was purchased from the Birmingham Slag Co., was prepared at its plant at Fairfield, and shipped to the Abernant siding where it was unloaded by a P&H crane and ¾-yard clamshell into trucks which hauled it to the job site. Eight trucks, holding 4 tons each, hauled the material an average of 8½ miles and dumped it down the center of the road. A Galion 101 power grader knocked down these piles and spread the material out as a leveling and shaping course varying in thickness from 0 to 1 inch, or an average of 40 pounds to the square yard. The cold-mix was spread over the full width of pavement in sections so that there was little interference with traffic. The temperature of the mix at the plant was 150 degrees F but had cooled to air temperature by the time it reached the road. Rolling was done by two Galion 7½-ton tandem rollers.

As soon as possible, within two weeks at the most, a finishing course of the same material was laid at the rate of 60 pounds to the square yard for a uniform ⅝-inch thickness. This course was put on by two Adnun Black Top Pavers, using a 10 and an 8-foot spreader bar. They worked from 300 to 500 feet apart in two lanes so that traffic could move between them. After rolling, the surface was covered with a light coating of creek-bank sand thrown on by hand from a truck, at the rate of a pound of sand to the square yard, to prevent the plant-mix from being picked up by the wheels of passing trucks and automobiles.

The cold-laid plant-mix had slag for aggregate in the following screen proportions:

Sieve Size	Per Cent Passing
½-inch	100
No. 4	70
No. 10	46
No. 20	30
No. 40	18
No. 80	7
No. 200	3

A 1-ton batch contained 150 pounds of AC-8 asphalt, of 85 to 100 penetration, and 2 gallons of naphtha as a liquefier.

Personnel

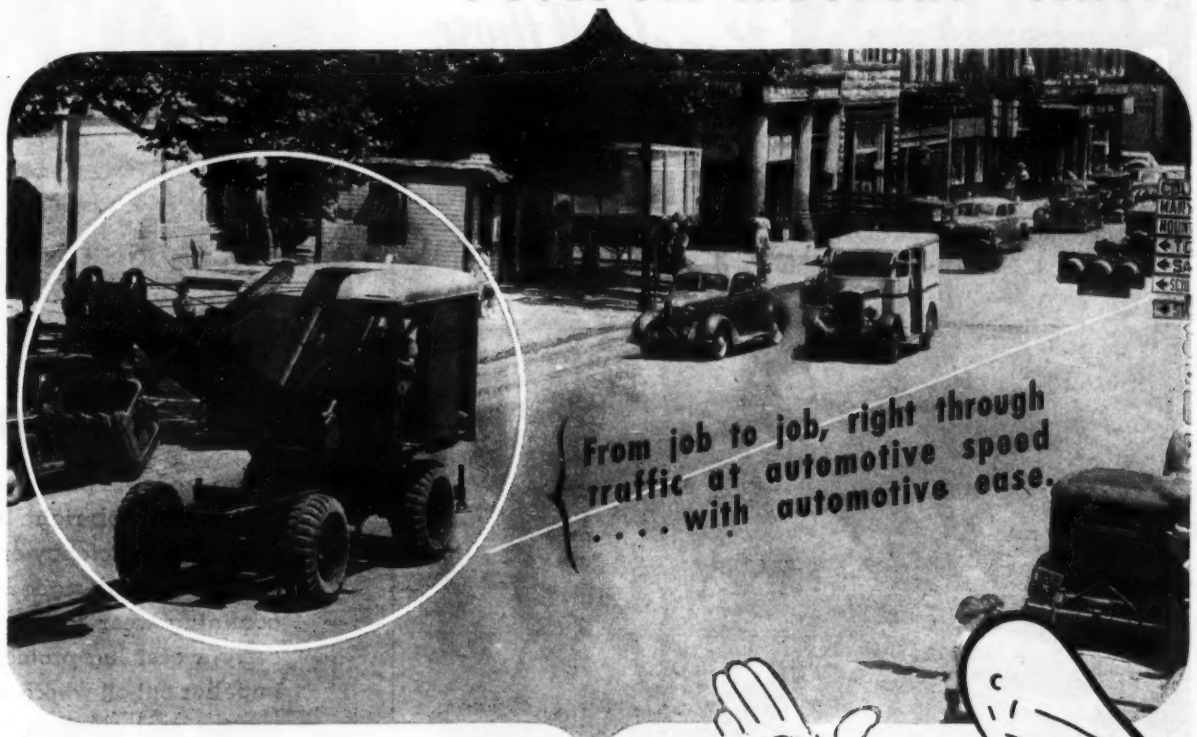
The state maintenance force doing this work was composed of 21 convicts and 11 free truck drivers. M. H. Findley was Resident Engineer in charge of the work and R. T. Cobb was Foreman.

G. W. Phillips is Construction and Maintenance Engineer for the Alabama State Highway Department, with J. F. Tribble as State Bituminous Engineer and F. W. Weldy, Assistant Maintenance Engineer. This work is located in the Third Division of which S. J. Cumming is Division Engineer.

Charles E. Carey Dies

Charles E. Carey, Regional Director of the U. S. Bureau of Reclamation, with headquarters in Sacramento, Calif., died on September 2 at the age of 55, following an illness of several months. Mr. Carey had been chief administrative officer of the Reclamation Bureau in northern California since September, 1943.

"WRAPS" ARE OFF The Latest and Greatest Development of a 5-Year-Old INDUSTRY "FIRST"



"Fathered" by the World-Famous SUPERCRANE

. . The Amazingly New and Different

General Type 10 MODEL 105

ONE-MAN . . . ONE-ENGINE . . . ON RUBBER

Five years ago General "scooped" the industry with a great "first"—the one-engine, one-man operated, pneumatic-tired Supercrane. Carrying this development a great stride forward, General now takes the "wraps" off the *original* "Machine of Tomorrow." First announced more than a year ago, General's revolutionary Type 10, Model 105, is a profit-building rig that will go out and do more kinds of work—faster, better and cheaper—than you ever believed possible with a single machine . . . ½-yard shovel, crane, backhoe, dragline, clamshell, magnet and piledriver "rolled into one" and rolling with automotive smoothness on a cushion of air.

Here is mobility you must see in action to appreciate. Here is easy, positive, instant-response, metered air control you can "feel" and guide with your fingers at all times. Here is a design so practical that swing, travel and boom hoist may be performed independently or simultaneously.

Test-Proven Advancements

Fast highway travel (20 "plus" miles per hour); optional 4-wheel drive; air booster steering; independent, easily accessible assemblies; heavy-duty engine, transmission and clutches; self-counter-weighting machinery; 4 speeds forward and reverse; quick interchangeability of attachments . . . are only a few of the remarkable test-proven advancements. Write for the full story today!

THE GENERAL EXCAVATOR CO., Marion, Ohio. Builders of the famous Supercranes and a complete line of shovels, draglines and related equipment; diesel, gas, electric—½ to ¾ yd.

GENERAL EXCAVATOR CO.

Washed-Out Highway Is Speedily Repaired

There are about 1,000 miles of dirt roads in Bacon County, Ga., of which about 500 miles are sand roads running through terrain where frequent rains cause washouts, despite regular yearly improvements. Many of these roads have been used by war workers traveling to Brunswick, and regularly serve as farm-to-market, mail, and school-bus routes.

When 4 inches of rain last spring washed out a sand road 10 miles south of Alma, R. L. Jordan, Bacon County Road Superintendent, got the county's D Tournapull to the job in fast time. Starting from the County Courthouse, the rig traveled over 8 miles of U. S. highway and 2 miles of county road, arriving at the job in 40 minutes.

The road to be repaired is 21 feet wide. With the ground still too wet to bring in dirt from a borrow pit, fill dirt was taken from two hills, one 500 feet west and another 800 feet east of the washout. Twenty minutes after the Tournapull arrived, the first car went through, and fifteen minutes later, the road was filled in. Thus the washout was repaired in a total of thirty-five minutes.

Bacon County, Ga., repaired a washout in 35 minutes with this Tournapull.

Bacon County finds many other jobs for this dirt-moving equipment, including placing fill over drainage pipe.

Recent Changes Made In I-H Branch Manage

Announcement has been made by th International Harvester Co., Chicag Ill., of a number of changes in its m tor-truck branch management. Dani J. Bradley, who has been Assista Manager of the Syracuse, N. Y., branc has been made Manager of the Phil delphia motor-truck branch, succeed ing C. D. Roice who is now in the Fo eign Operations Division.

E. H. Watkins has been promote from Assistant Branch Manager in Ne York City, to Manager of a new moto truck branch being established in Syra cuse. Paul McLaughlin has been ad vanced from the position of nation account supervisor at New York Assistant Manager, and will specializ on fleet sales.

JACKSON VIBRATORY PAVING TUBES

Will help YOU Knock off those BIG JOBS and NET MAXIMUM Profits!

Upper photo shows dual vibrating tubes submerged. Inset—tubes raised.

Here's the machine that will enable you to meet and beat competition — to handle more of those highway and airport paving jobs and to realize the largest possible profit margin. It's keyed perfectly to the big post-war paving program. Added to the features which have long made it the most advantageous equipment of its type are many refinements coming out of its wide application to wartime paving of airports.

HERE ARE, SPECIFICALLY, SOME OF THE THINGS THE JACKSON VIBRATORY PAVING TUBE WILL DO FOR YOU:

1. Gives you perfect compaction and placement of even the harsh, otherwise unworkable mixes, and thus
2. Enables you to take full advantage of the dryer, more economical mixes.
3. Provides faster finisher progress.
4. Perfect puddling of concrete at the joints and side forms.
5. Through internal vibration of thick slabs up to 25 feet in width.
6. Ample reserve power to offset fast drying and setting conditions.
7. Ample Power Plant reserve to run extra vibrators, tools and lights.

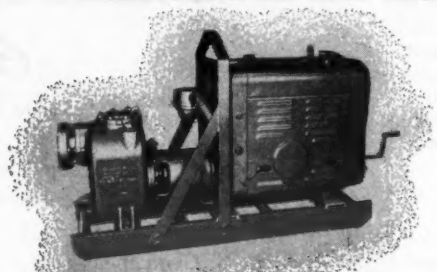
To capitalize to the hilt on the unprecedented paving program ahead, by all means get the complete details on JACKSON Vibratory Paving Tubes. Write today.

Manufactured for
JACKSON VIBRATORS, Inc.
by ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICH.

...how simple they are!

There are fewer parts in Carver pumps because every part does its job right. No gadgets have to be added to step up efficiency or correct faults. Impellers are scientifically designed with web-reinforced vanes confining wear to but one side. Renewable liners carry a cast lug protecting the scroll casing at the impeller cut-off where wear is greatest. The wearing surface seal rings of the Carver Lifetime Seal are made of Tungsten Carbide—a material so hard it cuts glass like a diamond.

Every Carver Pump carries a "Certified" tag which means that it has been carefully tested and fully meets our high standards for performance on the job. Write for details or see your local distributor.



THE CARVER PUMP CO.
Muscatine, Iowa

CARVER CENTRIFUGAL Certified PUMPS

SUPPORT YOUR PAYROLL SAVINGS PLAN

All-Inclusive Service Trend in Truck Field

There was a time when manufacturers of motor trucks felt that their responsibility ceased with the sale of the vehicle, and that its servicing could rest for the most part with general operators in the service field. This philosophy gradually changed, and truck branches and distributorships set up efficient shops and parts departments where the specialized needs of the vehicles could be met. A still further step in all-inclusive service is being taken by the White Motor Co., Cleveland, Ohio, which pioneered in personalized service to operators and is now going further to meet demands for accessories.

White's personalized service program was started before World War II; its service department was modernized; and testing and repair equipment was installed in branches and service shops. These facilities played an important part in the maintenance and conservation of trucks, so essential to the war effort. However, although servicing, repair, and replacement parts were all available under one roof, truck owners still had to go elsewhere for such accessories as tires, batteries, lamps, safety devices, etc. So important does White consider this accessory service that a regular department, known as the Tire & Accessory Sales Department, has been established, with Ernest O. Kampmeier, former Service Merchandising Manager, in charge. In addition to seven years' experience with White in both office and the field, Mr. Kampmeier was previously connected with Firestone Tire & Rubber Co. in the sale and service of automotive accessories.

A solid program of customer service has been set up, and the establishment of regular accessory stores in the company's branches, distributorships, and dealer outlets is being pushed. These accessory stores, as planned, are closely connected with the parts departments, and friendly intelligent service by men who know trucks is available. White believes that this "full-service" policy will be of value to its customers, by providing greater efficiency in complete truck servicing, and eliminating a time-consuming procedure in securing truck needs.

Ethyl Corp. Reorganizes Field-Sales Operations

Following a ten-month study to determine the post-war wants and needs of its customers, the Ethyl Corp., New York City, has announced a reorganization of its Sales Department field operations to conform more closely with oil-company marketing areas. Hereafter, the Ethyl Sales Department will operate on the basis of four principal marketing areas, known as the Eastern, Central, Southern, and Western Areas, with a sales manager for each. Divisions within the areas are: New York and Philadelphia in the Eastern Area; Kansas City, Chicago, and Dayton Divisions in the Central Area; Tulsa and Atlanta in the South; and Los Angeles and Seattle Divisions in the Western Area.

The four Area Sales Managers named are: Richard C. Murphy, Eastern Sales Manager for New England and the Middle Atlantic states as far south as and including South Carolina; James E. Boudreau, Sales Manager for the Central Area; Harold R. Berg, Sales Manager for the entire South; and Sanford M. Wagner, Western Sales Manager for the territory west of the Rockies.

In addition, George Krieger has been named to a new post of Special Assistant to Julian J. Frey, General Sales Manager, to coordinate customer programs affecting more than one of the principal areas and to supervise certain services on a national basis. Donald S. Flynn, formerly Assistant Manager of the Kansas City Division, has been made Manager, to succeed Mr. Berg, now Southern Sales Manager. Mr. Wagner will retain, for the present, his position as Manager of the Los Angeles Division as well as serving as Western Sales Manager. Matthew A. Taylor, former Manager of the Boston office, has been made Manager of the newly created division in Philadelphia. The services formerly rendered by the Boston office have been transferred to the New York Division.

The remedy for a bad law is repeal, not better administration.

Write for Details

A TOUGH ROLLER FOR TOUGH JOBS

Pierce-Bear 2-5 Tons Variable Weights

Engineered for economical operation where the going is tough. Compact, easy to operate. Narrow rear roller gives heavy-duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy-duty Model "B" gasoline engine.

Manufactured by

H. W. LEWIS EQUIPMENT COMPANY

431 Hodgen Avenue
SAN ANTONIO 3, TEXAS
Phone, Garfield 6137

YOU CAN KNOW HIS CLASS BY HIS SWEATER . .

10-S MIXER
THIS MACHINE COMPLIES WITH A.G.C. STANDARDS
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Pedestrian Problem In Control of Traffic

Solution Lies in Separation by Special Overpasses or Subways, Fences, and Traffic Islands

✦ OF all the phases of highway traffic control, there is none so persistently urgent as the pedestrian problem, Herman A. MacDonald, Commissioner of the Massachusetts Department of Public Works, pointed out in his paper at the Second Highway Traffic Conference of the Eno Foundation for Highway Traffic Control in New York City in May.

The importance of pedestrian traffic is derived from a number of factors. In the first place, it is everybody's problem; no matter what means of transportation is used for conveyance to and from a point, all passengers arrive at their final destination and become a part of the pedestrian traffic pattern. Each individual, therefore, has a dual interest in the relation of pedestrian traffic to the entire traffic problem, because he is concerned both with the efficiency of vehicular movement and at the same time, since he is frequently a pedestrian, with the maximum protection of pedestrians.

Traffic v. Pedestrians

The present legal basis for the relation between highway users, including pedestrians and the drivers of vehicles, is founded upon common-law practice developed centuries ago. In brief, it is that all highway users have an equal right to use all parts of the public way for lawful purposes and all have a responsibility to exercise due care in such use to see that they may not cause injury to those who may be in the way. So far as the operation of vehicles is concerned, various modifications and qualifications of this rule have been made by statute or ordinance. Thus, for example, the driver of a vehicle must refrain from operating in that part of the street which has been designated as a sidewalk. The mutual right to use the roadway surface both for pedestrians and motor vehicles and the mutual responsibility for the prevention of accidents still prevail.

It must be clear to all who have become interested in the problem that such mutual rights and obligations are no longer satisfactory. The power to do injury is not equal, though in some cities the power to obstruct is more nearly equivalent. These rules were all right for horse-drawn vehicles. The motor vehicle has transformed the situation, but many states refuse to change the laws relative to pedestrian responsibility.

We have held that the pedestrian's rights upon the roadway have been superior to that of the motorist. The fact that he is much more vulnerable than the motorist has led the pedestrian to be particularly insistent upon this right. This has made effective control of pedestrians difficult. Furthermore, the pedestrian, because of his universal direction of movement, can make more conflicting maneuvers than the average motorist.

Provision for Pedestrians

In the long run, the maximum amount of success in controlling pedestrians may be attained by establishing separate paths, such as pedestrian underpasses and overpasses, which place him on a different level from that of vehicular movement, and fences to keep him from crossing the natural paths of motorists.

In innumerable cases where pedestrian subways and overpasses have been built, walkers have elected to cross at grade rather than make the effort of going up and down stairs. Such structures, therefore, to be effective should be built where the pedestrian may be fenced in and forced to use them. Also, they should be sufficiently illuminated and policed.

It is probable that fences should be erected on numerous streets and highways where center dividers of a minimum width of 2 feet are permissible. It may be advisable to install fences back from the corner of intersections a sufficient distance to discourage jay walking.

There is little doubt that the utilization of fences for the entire length of loading and unloading pedestrian islands, so that the pedestrian is forced to enter and leave the island at the crosswalk, is fundamentally sound. Traffic islands are one of the best means of assisting pedestrians, and channelization is an excellent method of controlling the movements of vehicles.

At an intersection, the differential in speed between a pedestrian at 2 or 3 miles and the motorist at 20 to 25 miles an hour is too great to permit efficient timing. Furthermore, unless both right and left turns are prohibited, which of course is impracticable, vehicular traffic is forced to fight its way through pedestrian lanes. This inefficiency over a period of years amounts to a tragic loss, both in accidents and congestion.

Cost of Protection

These measures of assuring pedestrian safety may seem costly or even needless. But are they? Each one of us contributes to the problem of the pedestrian on our highways by our own actions and thoughtlessness. If you have any doubt of this, just try an experiment on yourself. Note the difference in your attitude when you, in a motor vehicle, sit behind the wheel, as compared with your attitude when you, a pedestrian, cross the highway.

It is conceded that the post-war era will witness a great increase in vehicular volume. Authorities likewise foresee a change in driving habits. Speed, they point out, will menace every stretch of highway. Were it possible to accelerate the thinking and movement of pedestrians, the increased speed of vehicles might be somewhat offset. Unfortunately, however, the pedestrian will continue to be cast in the same old mold. Neither his mental nor physical agility is likely to improve with the years. Being the more vulnerable of the two, the pedestrian will continue in increasing measure to fall victim to the automobile, unless sufficient provision is made to handle the pedestrian problem in the overall control of traffic.

Two Staff Advancements At Republic Steel Corp

N. J. Clarke has been made Senior Vice President of the Republic Steel Corp., Cleveland, Ohio. Since 1930, he has been Vice President in charge of sales at Republic Steel.

J. M. Schlendorf is now Vice President in charge of sales, having served as Assistant Vice President in charge of sales since 1936.

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When the forms are stripped, the stringer is simply pulled out from under the big blanket, folded down along the slab side and held with earth. Should a truck or tractor bang against the side of the slab, it damages only the stringer sheet containing 90 sq. ft. of paper, costing approximately $1.00. The main blanket, representing an investment of $15.00 to $24.00 is untouched! Then, too, the edges of a blanket under the old-fashioned method were always the first part of the unit to rot and deteriorate. Often a blanket had to be discarded because the edges were frayed and worn, even though the rest of the cover was in excellent condition.

This won't happen "The Richkraft Way!" It's smooth—It's simple—It doubles the life of road curing blankets and offers a big savings to the contractor.

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Now for the first time in the history of construction, scuff proofed paper is available in 10 ft. widths. This means that on a 22 ft. road Richkraft will use only three rolls to make up a blanket instead of the usual four, reducing the labor of sealing laps by one third and providing a smoother rolling blanket in the field.

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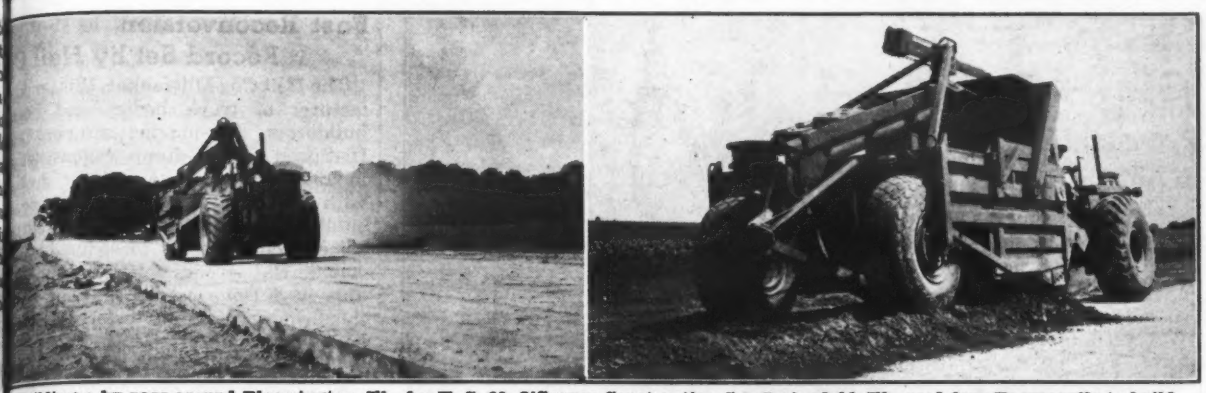

Building a by-pass around Bloomington, Ill., for U. S. 66, O'Connor Construction Co., Springfield, Ill., used four Tournapulls to build up shoulders 2 to 3 feet along the newly laid concrete strip. The rigs brought in 30,000 cubic yards of hard damp clay from roadside borrow pits, hauled 0.9 mile on the new concrete pavement, and spread their loads along the shoulders.

New Pump Handbook

A 416-page pump engineering data book confined to the application of centrifugals to all types of pumping problems has just been issued by Economy Pumps, Inc., Hamilton, Ohio. The volume is a handbook, catalog, and price list combined, with many illustrations, diagrams of pump performance, and tables covering pump capacities, efficiency, and electric-motor or engine horsepower. It is well indexed, with a simple device for locating the section in which you are interested.

This comprehensive pump data book is priced at $2.00, but readers of CONTRACTORS AND ENGINEERS MONTHLY who are pump users may secure a copy gratis by writing direct to the manufacturer on their business letterhead.

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On those wall jobs, floor jobs, roofing jobs, concrete curing jobs—for lining buildings, protecting materials or partially completed work—for the countless tasks that a reenforced, water-proof paper must do—call for Richkraft!

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Railroad Construction In Brazil, Bolivia, Chile

Rail and Highway Link Will Provide Transcontinental Transportation and Open Up Vast Previously Isolated Area, As Well As Oil for Brazil

By MAURICE E. GILMORE, Director of Overland Transportation, Office of Inter-American Affairs

✦ THE long-discussed Santos-Arica Transcontinental Railroad uniting Brazil, Bolivia, and Chile is about to become a reality. This great line, the dream of railroad builders for nearly a century, is destined to solve a good many of the economic problems facing these three republics. Uppermost in this list is Brazil's fuel problem of where to get petroleum with which to drive the trains and power the growing industries of this republic. For Brazil, larger even than continental United States, has discovered little oil and high-grade coal within its borders.

This transcontinental railroad project had its inception in the agreement signed between Bolivia and Brazil at Petropolis in 1903, by which Brazil agreed to build a railroad from Corumba, on the Paraguay River at the border of Brazil, to Santa Cruz, near Bolivia's oil fields. Brazil is to be paid in Bolivian oil. This work is now under way. The Corumba-Santa Cruz section is not, however, the only missing link in the transcontinental line.

On the Pacific side, a railroad extends from the Chilean port of Arica to La Paz, capital of Bolivia, and a second line extends from La Paz to Cochabamba, Bolivia's second city. But there is no railroad and not even a year-round passable highway between Cochabamba and Santa Cruz, two cities separated by 500 kilometers (a kilometer equals 0.6214 mile) of very difficult mountainous terrain.

Highway Is Important Link

The Bolivian Development Corp., a Bolivian entity, to which the U. S. Export-Import Bank has agreed to make a loan up to $15,500,000, has definitely decided to build a highway to bridge this gap of 500 kilometers.

The reasons for this decision, as set forth by the Development Corp., are as follows: A railroad through this mountain country would cost $35,000,000 and take eight years to build, while a highway, being shorter, would cost about $13,000,000 and could be built in four years. A railroad would require much steel, construction equipment, and other imported materials now difficult to obtain, whereas a highway would not require so much imported material. A highway could be used on a 24-hour-a-day basis but a railroad is limited to scheduled trains. And, lastly, there is not enough traffic in immediate prospect to justify the investment of $35,000,000 in a railroad at this time.

A $9,500,000 contract for the construction of this highway was recently awarded to Compania McGraw-Warren Bros., S. A., composed of the U. S. firms of F. H. McGraw & Co. of Hartford, Conn., and Warren Bros. Co., Cambridge, Mass.

The significance of this railroad-highway route to the economy of South America lies not in the fact that it will be possible to trans-ship merchandise and freight between two oceans, as very little through traffic is expected to move over this route, but in that it will be possible for freight and passengers to move with economy and dispatch in a vast area where transportation previously was non-existent. Within the area served by this line and its branches, the hinterland of Brazil, Bolivia and

(Concluded on next page)

Railroad Construction In Brazil, Bolivia, Chile

(*Continued from preceding page*)

Paraguay, there are thousands of square miles virtually uninhabited but suitable for agriculture and grazing.

The great advantage to Brazil lies in having an assured and abundant supply of petroleum at her door, a supply which cannot well be cut off by another war in Europe or in Asia.

Progress of Railroad Work

Brazil is now building a branch line to the south, from Campo Grande, 894 kilometers west of Bauru, to connect with the Paraguayan port of Concepcion on the Paraguay River. This will give Paraguay a rail outlet to the port of Santos. This line is already completed and in operation for 173 kilometers or as far as Maracaju, and is being extended to Ponta Pora on the border of Paraguay, 241 kilometers from Campo Grande. Another 188 kilometers will bring this line to Horqueta in Paraguay from which point a railroad is already in operation to Concepcion. All of these railroads are built with a 1-meter gage.

Continuing westward on the transcontinental line, at Porto Esperanca on the Paraguay River, 1,273 kilometers from Bauru, a great reinforced-concrete bridge is now being constructed (See C. & E. M., Aug., 1945, pg. 19). This bridge, which is said to be "of majestic proportions", has the longest reinforced-concrete span thus far erected in Brazil, a span of 360.9 feet. The total length of the structure is 6,562 feet. The bridge, which is expected to be completed by the end of this year, will carry both railroad tracks and a two-lane highway.

Between Porto Esperanca on the Paraguay River and Corumba (in Brazilian territory) the 103 kilometers of the Northeastern Railroad which remains to be built is about 50 per cent completed. The traffic between Porto Esperanca and Corumba now moves by river steamer.

West of Corumba in Bolivian territory trains are now operating on the first 170 kilometers of the Corumba-Santa Cruz line and the earth work ready for rails has been completed as far as Kilometer 400. Difficulty in obtaining steel rails in wartime has delayed the completion of this section of the line. Between San Jose (Kilometer 404) and Santa Cruz (Kilometer 662) a rather difficult engineering problem is presented in that the line here crosses a flat swampy region which is actually lower than the bed of the Rio Grande, a stream flowing to the west. In the rainy season the river overflows this depression. Whether to build a high embankment or to make a detour to the northward has not been decided.

Argentina has already extended its state-owned railroad to the border of Bolivia at Yacuiba and now, under an agreement with Bolivia, is carrying this line northward to Villa Monte on the Pilcamayo River. Bolivian crude oil is already being shipped to Argentina over this line. Here a remarkable situation presents itself. Bolivian oil is exported to Argentina because there is no way to get it from the lowlands to the highlands in Bolivia, while, at the same time, Bolivia imports oil from distant wells in Peru for use in La Paz and other centers in the highlands. This situation will be corrected once the highway between Cochabamba and Santa Cruz has been completed.

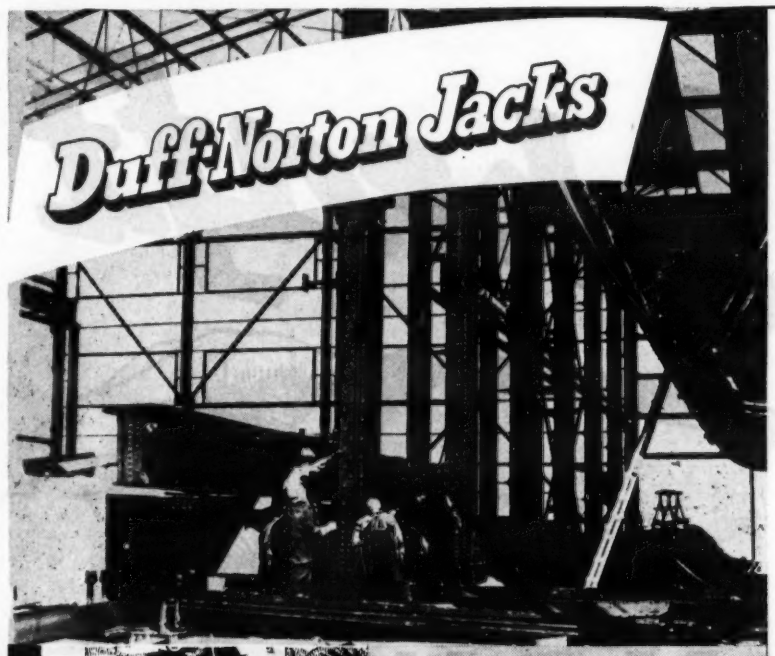
In the meantime, the Bolivian state-owned railroad seems determined to extend its line from Cochabamba to Santa Cruz. Rails have been laid and trains are now in operation for 128 kilometers or as far as Vila Vila and earth work (but not bridges) has been completed for another 60 kilometers beyond this point. Progress has been halted by the need for an 800-meter (a meter equals 3.281 feet) tunnel for the construction of which machinery must be imported, and a 54-meter steel bridge.

This portable crushing plant owned by Rogers Construction Co., of Dayton, Wash., consists of two Telsmith 36-inch crushers and Pioneer conveyors, powered by four Caterpillar diesels, three D13000's and a D4400. Hourly production is 80 to 100 tons of rock.

Fast Reconversion Record Set by Heil Co

The Heil Co., Milwaukee, Wis., manufacturer of truck bodies and hoists, bulldozers, dirt-moving scrapers, and Hi-Speed bottom-dump wagons, which in 1939 converted to war production with such rapidity that it won a special citation by the Government, used the same effective plans to swing back to commercial production in one week after V-J Day. During the war years this firm turned out over forty different heavy-duty military items.

To produce the volume demanded, Heil expanded its manufacturing facilities until they now cover 17 acres and house the most modern equipment. All buildings, tools, and facilities are owned outright by the company so that no long reconversion period was necessary. Commercial production is once more under way, and the company announces virtual "in stock" service on its standard units.



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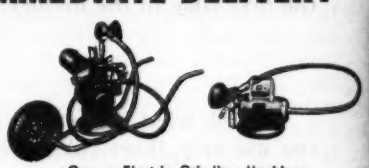
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New Twin-Silo Plant For Batching Cement

A new all-welded portable twin-silo cement batching plant with storage capacities of 761, 1,044, 1,327, and 1,600 barrels has been announced by the S. Johnson Co., Champaign, Ill. It is claimed that this new portable plant can be set up faster and, although it is the largest portable unit in the complete Johnson line, it can be erected without a crane if necessary. All time-wasting bolt and nut assembly details have been eliminated, the manufacturer states.

The leg section on the overhead silo is so designed that it can pivot on a base plate mounted on a concrete footing. The pivot can then be utilized to tip the entire leg and silo assembly into place by means of a gin pole and a tractor winch. Other equipment used with this newest plant includes the Johnson cement batcher and bucket elevator, and screw conveyor with capacities of 300 barrels per hour. The Johnson Bin-Gage indicates high or low level of cement in the silo. Like other Johnson plants, the Twin Silo may be charged from box or hopper cars, or from trucks.

Complete information on this post-war plant for high production may be secured by interested contractors and engineers direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Shifts in Personnel Of Mo. Highway Dept.

Effective September 1, 1945, several changes were made in the engineering personnel of the Missouri State Highway Department, according to Carl W. Brown, Chief Engineer. The major shift makes S. M. Rudder, Assistant Chief Engineer for the past nine years, Manager of Highway Planning, a joint enterprise of the State and the Federal government.

P. H. Daniells, Engineer of Plans and Surveys, will succeed Mr. Rudder as Assistant Chief Engineer, and C. P. Owens has become Chief of the Surveys and Plans Division. Fred Harris, formerly Division Engineer at Sikeston, has been transferred to the headquarters office in Jefferson City in charge of supplementary roads.

M. S. Gwinn, who has been acting head of Highway Planning, has been made Division Engineer at Sikeston. Other changes include the transfer of J. L. Brown, Division Engineer at St. Joseph, to Springfield. His successor as Division Engineer at St. Joseph has not been named at this time. O. D. Chrisman, who was originally assigned this post, has resigned to enter the private engineering field.

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The Truk-Loder will do most of the operations of a large and costly shovel—loading dirt, gravel, crushed stone, street patch material, snow, leaves or refuse. The operations are economical and the Truk-Loder is priced within the range of the smaller contracting companies and smaller communities.

For those who require a shovel for a few days, or for a few truck loads at a time, the Truk-Loder is a most practical unit, since by removing two hinge pins, it can be detached in only a few minutes.

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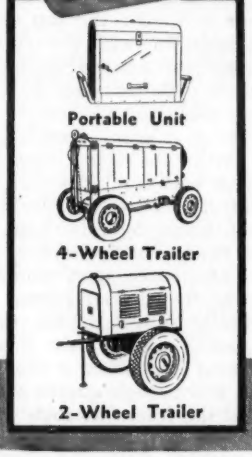

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Mechanized Clearing At Site of Reservoir

Special Pusher Rigs Above Dozers And Use of Blades to Catch Roots Save Much Operating Time

✦ PART of the great Deschutes Irrigation Project of the U. S. Bureau of Reclamation necessitates the clearing of 10,500 acres lying 43 miles upstream from Bend, Oreg., on the Deschutes River, to permit storage of some 180,000 acre-feet of water behind the new Wickiup Dam.

Started in 1938 when labor from the Civilian Conservation Corps was available to the Bureau and it was desired to utilize hand methods to the greatest possible extent, the early clearing was done by hand crews. With the beginning of the war and the resulting shortage of man-power, other methods had to be devised. The area is comparatively level with no steep grades but is heavily timbered with jack pines, most of which are only 6 to 8 inches in diameter but closely spaced, some sections having as many as 900 trees per acre. The soil is generally a dry and loose pumice.

At the start of machine clearing, tractors with standard bulldozers or Isaacson clearing blades were utilized but, because of the unusual conditions encountered, special rigs to be added to the tractors were designed and built by the Bureau of Reclamation after a number of experiments. These new rigs consist of electrically welded frames built of 60-pound railroad rails substantially braced and cross-braced, attached above and in front of the bulldozer or clearing blade so that their thrust is carried back to the frame of the tractor. Extending 6 feet in front of the blade, these frames carry a built-up cross member which does the work of pushing the tree over. This cross member is formed of three 1 x 6-inch steel plates, 10 feet long, their edges welded together to form an arrowhead-shaped member reinforced by a 1-inch square bar of reinforcing steel in its nose. Straps of 1 x 4-inch steel, welded from near the center of this pushing member to the side arms, provide additional support.

The two rigs used on this project

Specially designed rigs speed clearing at the site of Wickiup reservoir in Oregon. Above, a special pusher and an Isaacson blade on a D8; at right above, a slightly different style of pusher used with a Baker bulldozer; right, the blades used for piling up trees for eventual burning.

differ somewhat in design in regard to the blade on which they are mounted. On an RD8 carrying a Baker bulldozer, the frame was extended along the angle of the arms and over the top of the blade in a direct line with the top edge of the supporting arms, while on the second tractor, a D8 carrying an Isaacson clearing blade, the framework was extended up to a point about 2 feet above the top of the blade, then bent forward in a horizontal position, and extended 6 feet in front of it. The angle made in the frame by this change in direction of the line of thrust was reinforced by additional steel members welded across the interior angle. The usual hydraulic controls of the Baker bulldozer were removed, two sheaves substituted near the bottom of the bulldozer blade, and a single double sheave at the top of the frame through which was woven a six-part line to handle the additional weight of the heavy steel pushing frames.

In use, this special frame, which is raised and lowered with the bulldozer or clearing blade, is pushed against the tree at a point 6 or 8 feet above the ground. As the tree falls, the bulldozer blade is lowered slightly to catch the upturned root system and prevent the intrusion of the roots under the blade. The use of this rig eliminates the need for backing away and shifting into forward gear to get under the roots usually coincident with this type of operation and thus speeds up the work.

Because of the additional weight of the pushing frame which must be raised by the cables controlling the bulldozer, the foreman prefers the use of straight teeth under the blade rather than curved teeth which are sometimes used too much by the operator in attempting to raise heavy logs while windrowing.

Trees felled by the two tractors carrying the pushing frame are piled by two D8's, two D7's, and a Caterpillar tractor, usually working in pairs on piling the trees. The long piles are made parallel, approximately 150 feet apart, and 8 to 10 feet high. These stacks are permitted to dry through a winter and summer and then burned immediately following the first rain of the autumn.

Another piece of equipment on the job, useful in making repairs to the tree-piling and pushing equipment, is an Allis-Chalmers tractor equipped with an A-frame 12 feet high built of 4-inch pipe with a single cable running from the tractor power unit over a sheave in the top of the A-frame. A 1-ton chain block was suspended at the end of the cable and is used to lift heavy parts of other tractors undergoing repairs, when slow movement is required.

Personnel

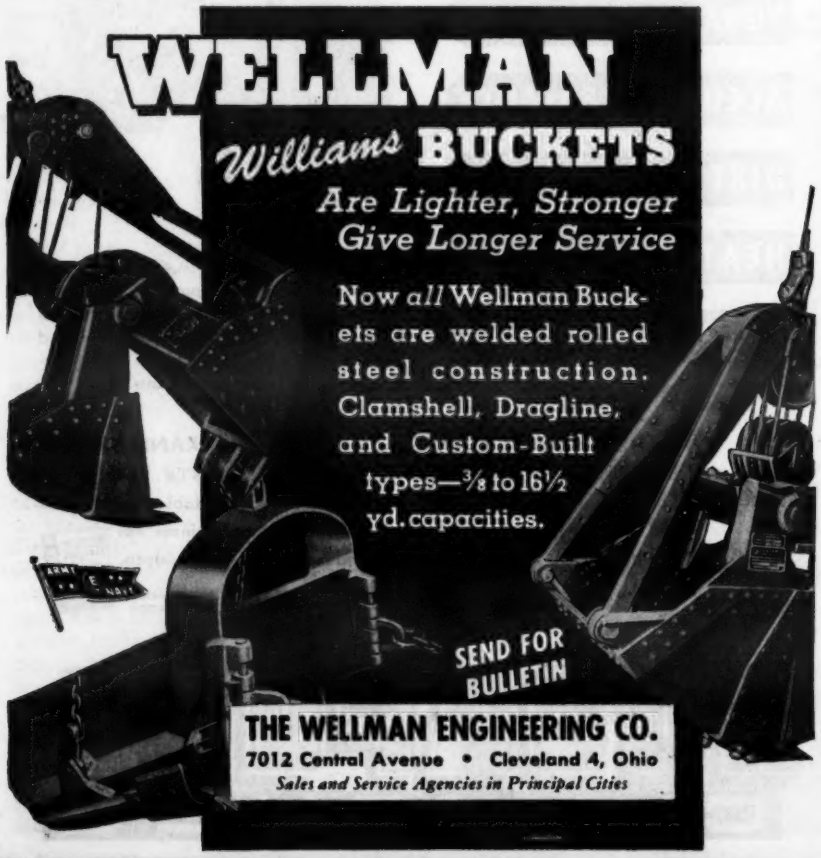
The clearing at the Wickiup Reservoir is under the direction of the Bend, Oreg., office of the U. S. Bureau of Reclamation, of which C. H. Spencer is Construction Engineer. E. J. Merrill, Foreman for the Bureau of Reclamation, is in charge at the site of operations.

Automotive Parts Are Available as Surplus

State and county highway engineers and contractors will welcome the news that very soon hundreds of millions of dollars' worth of standard automotive parts will again be available.

The Office of Surplus Property has announced vast surplus stocks of parts to be released on a fixed-price method of sale. Minimum orders which are accepted are $500, and purchase may be made only by fleet owners or operators, dealers, and garages.

Inquiries in regard to the proper procedure for placing orders for these parts should be addressed to your nearest Office of Surplus Property Regional Office.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...ural Road Program For Keystone State

A secondary-highway improvement ...gram to cost approximately $10,000,-... is now being drafted by the Penn-...lvania Department of Highways. ...lans for the 3-year program will be ...mpleted this year and carried out by the State and Federal government.

The Department of Highways took over the farm-to-market road system, comprising about 20,000 miles, in 1931, and from its own funds went ahead and took the farmer out of the mud. John U. Shroyer, Secretary of Highways of Pennsylvania, reports that the Department has continued to improve farm roads from that date without asking any subsidy from the Federal government. During this period Pennsylvania has spent $127,000,000 of its own money and increased the rural-road system to approximately 25,000 miles.

Roads with a traffic count of 2,300 cars or less a day in Pennsylvania will benefit from the new secondary-road program. Improvements will include grading, drainage, graveling, and some all-weather surfacing. Anticipating much of this type of work, Pennsylvania has already begun improving more than 5,000 miles of road through its 1945-46 resurfacing, surface-treatment, and stabilization programs, costing more than $13,000,000.

Ramsey Named President Of Ransome Machinery Co.

In addition to his position as Executive Vice President of the Worthington Pump & Machinery Corp., Hobart C. Ramsey has been made President of the Ransome Machinery Co., Worthington subsidiary in Dunellen, N. J., which manufactures concrete mixers and pavers.

Other Ransome officials recently appointed are J. G. Ten Eyck, formerly President of the industrial engineering firm of Ten Eyck, Inc., who has been named Vice President and General Manager of the Dunellen plant, and Kenneth W. Horsman, formerly Superintendent of welding and steel fabrication at Worthington's Harrison, N. J., works, now filling the post of Works Manager for Ransome. Mr. Ten Eyck and Carl F. Oechsle, Vice President in charge of sales, are newly elected directors of the company.

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Families of brave people—friends who fought on our side—are wandering aimlessly today. Going home? They have no homes!

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